BOSTON UNIVERSITY

GRADUATE SCHOOL

THESIS

THE RELATION OF HEREDITY TO EUGENICS.

SUBMITTED BY

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EYE COLORS IN MAN.

A. Pigment of choroid coat and pigment of iris absent. The albino eye. Red from unobscured blood vessels.

B. Pigment of choroid present. Iris without true pigment. Blue. Due to a purple layer on back of eye.

C. Iris with true pigments. Lipochrome or yellow pigment. Green or cat eye. Yellow pigment on blue background.

D. Melanic or black pigment. Hazel or gray eye. Dilute brown pigment around pupil only.

E. Brown eye. Melanic pigment; various shades from various dilutions.

F. Black eye. An abundance of melanic pigment.


A
B
C
D
E
F

The Relation of Heredity to Eugenics. (Analysis) .

1. Discussion of Heredity

(A) Fact of heredity and hereditary endowment are among the first principles of eugenics. Heredity is organic resemblance based on descent. Son is "chip off the old block." Living organism arises from living organism. Material continuity between succeeding generations.

(B) Three groups of the study of heredity.

(1) Microscopical examination of germ cells.

(2) Statistical consideration of data bearing on heredity.

(3) Experimental breeding of animals and plants.

(C) Theories concerning heredity.

(1) Cell theory 1831 and 1839. Nucleus chief structure. Nuclear membrane. Cytoplasm and Protoplasm. Chromosomes determiners of heredity. Centrosome the focal point. Somatoplasm the body tissues. Germ plasm gives rise to new individuals.

(2) Sexual reproduction. Union of egg and sperm maturation is the halving of chromosomes. Egg cell large,- sperm cell small. Gamete. Spermatocytes. Spermatids. Oocytes.

(3) Determiners of heredity.

(a) Chromosome theory. Chromosomes alike in both

germ cells. Believed to be determiners of heredity. Boveri's experiments with Sphaerechinus and Echinus.

(b) Enzyme theory. Brochemists find carriers of heredity in chemical nature of cell.

(D) Mendelian analysis of heredity.

(1) Unit characters and their combinations. People vastly different in physical, mental and moral traits as-- hair, hearing, musical ability and disposition. Inheritance is of certain unit characters only. Difficulty in classification of human beings because of unit characters, as, for instance the feebleminded.

(2) Variation - "Like produce like" not always true. No evolutionary advance but for variation. Proven by collecting data under rigid control. Much variation not apparent. Minor variation used in Bertillon systems of personal identification.

(3) Mendel's Law. Mendel an Austrian monk of the 19th century. Hybrid a cross of two species shown by crossing red and yellow corn. Essential feature of Mendel's Law. Independent units segregate in crossing.

(4) Mutation. Oldest case that of a plant, the fringed celandine. Found in 1590 by Sprengel. Bred true and gave rise to well known species. Purple beech is a mutant. Lamarck's evening primrose. DeVries mutation theory. Mutations very common. Example: Ancon breed of sheep. Taillessness in cats and dogs. Life cycle

of species like that of individual.

(E) Heredity and Sex. Impossible to control sex. Many speculations. Modern theories under two heads. (1). Sex dependent on external factors. (2). Sex dependent on internal factors in the germ plasm. Practical equality between sexes. One hundred six males to one hundred females. Color blindness common in men. Transmitted through daughters to their sons. Hemophilia inherited like color blindness. Only in parthenogenesis can sex be controlled. Incompatibilities strikingly shown in worker bee. Queen a fertile fool. Worker a sterile wit.

(F) Heredity of acquired characters. Inheritance of somatic mutilations only when they modify determiners in germplasm. Unit characters may be of simplex or duplex origin. Mendelian recessives and dominants. Interminable question. Galton first doubted heritability of acquired characters. Germinal variations thought to have arisen by five methods. (1). Due to external forces. (2). Natural Selection. (3). Hybridization. (4). Amphimixis. (5). Orthogenesis.

11 Eugenics. Galton originator of term. Study of agencies that may improve or impair racial qualities of future generations. Heritage the basis of triangle of life. Marriage considered by eugenists an experiment in breeding. Infant mortality. Eugenic legislation usually poor, rarely enforced. Research work in heredity needed.

Instruction of future fathers and mothers. The decrease of best individuals and increase of worst.

(1) Natural or Primary Eugenics.

(a) Positive Eugenics. Encouragement of parenthood of good stock. Only heredity of simpler qualities understood. Higher mental qualities complex or due to several unit characters. Ability more common than genius. Two "experiments" in positive eugenics in 19th century. Robert Browning and Richard Wagner. Parental age higher than formerly.

(b) Negative Eugenics. Discouragement of unworthy parenthood. Elimination of unfit only natural explanations for existence of fitness. Animal and plant stocks improved by rigidly applying laws of selection. Impossible in man. Lack of uniform ideals causing difficulty in breeding a superior race. Simon Newcomb. Advantages in eliminating the worst by segregation or sterilization. Transmissible and not transmissible characters. Medical analysis necessary. Marriage and parenthood not synonomous. Educate conscience or eugenic sense. Feebleminded an important problem in negative eugenics, also insanity and deaf mutism.

(c) Preventive eugenics. Racial poisons injure offspring through parents. Syphilis often cause of insanity or deaf mutism. Salvarsan a remedy. Alcohol. Gonorrhoea, cause of congenital blindness and sterility. Lead very harmful to women and offspring.

(2) Nurtural or secondary eugenics. Best nurture necessary for everyone. Includes education and many sciences as well as mere food. Care of expectant mother and child. Breeding of cows in Missouri. Galton's study of ordinary and identical turns. Professor Thorndike's work on school children in New York.

111 Bearing of Heredity on Eugenics.

(A) Vast amount of investigation into the laws of inheritance of human traits is necessary before definite instruction can be given as to fit marriage matings. Unit characters. A knowledge of peculiarities of germ plasm needed.

(B) Inheritance of family traits.

(1) Color of eyes, hair and skin. Color of eyes from iris. The eugenic value of inheritance of eye color and skin color lies in the fact that individual is better fitted for climate. Antipathy of red-haired people. Albinism.

(2) Musical ability developes early. Exact nature of inheritance not known.

(3) Temperament. Phlegmatic and nervous.

(4) Insanity.

(1). Organic Mental deterioration. Venereal diseases. Alcoholism.

(2). Functional Neuropathic taint. Melancholia.

(5) Nervous diseases. Nervous system complex. Hysteria

Criminals.

(6) Defects in different parts of body.

(a) Deafness.

(1). congenital deaf mutism.

(2). Otosclerosis.

(3). Catarrhal.

(b) Polydactylism.

(c) Noseblood.

(7) Fecundity.

(C) Consanguinity in Marriage. Inbreeding causes negative traits. Civilised nations oppose marriage of relatives.

(1) Barriers in nature of country.

(a) Islands. - Maine coast. Western Martha's Vineyard.

(b) Mountains. - Cretins and imbeciles of the Alps.

(2) Barriers of social nature.

(a) Clans and pride of blood. Desire to concentrate wealth. Royal families of Europe.

(b) Institutions for deaf mutes and "curable" insane.

(c) Religion. Friends. Dunkers. Amish.

(D) Influence of individuals on the race.

(1) Elisabeth Tuttle. Instrumental in raising the culture and learning of the United States.

(2) Jukes. Criminality, licentiousness and pauperism.

(3) Ishmaelites. Murderers, prostitutes, etc.

(E) Study of Genealogy and its importance to Eugenics. Records of physical and mental characteristics of indiv-

iduals. Eugenics Record office for collecting and cataloguing records. International Society of race hygiene in Germany.

(F) Eugenic significance of migrations in the United States.

(1) Early immigrations. Virginia colony. Dutch settlements. New England idealists.

(2) Recent immigrations. Danger from hereditary unfitness.

The Relation of Heredity to Eugenics.

There are certain important biological facts which are of immense significance for mankind, and are doubtless far more important in their bearing upon man than upon any living species. The first of these is the fact of heredity, and the second the fact that hereditary endowment, whether for good or evil, and, as the rule, both for good and for evil, goes vastly further in determining individual destiny than has been realised until recent years. These are among the first principles of eugenics, or race culture. Professor Castle has defined heredity as "organic resemblance based on descent." The son resembles his father for he is a "chip off the old block." It would be still nearer the truth to say the son resembles the father because they are both chips from the same block. When the son is said to have his father's hair and his mother's complexion, it does not mean that paternal baldness and a vanishing complexion are the inevitable consequences however. "Organic resemblance" between father and son, then is not due to a direct entail of characteristics in question but to the fact that the characteristics are based on descent from a common source. As far as is known, every living organism on the earth today has arisen from some preceding form of life. There are numerous methods of producing more life, where life already exists, for any animal or plant is continually transforming inorganic and dead organic matter into living tissue. By means of repair, injuries in man, for example skin wounds, are frequently made good. In producing new individuals there is always a material continuity between succeeding generations.

There are three (3) recent groups of the study of heredity. First, there has been a microscopical examination of the germ cells and the processes which occur in them when new organisms are formed. Second, studies have been directed to the statistical consideration of data bearing upon

heredity. Characteristics of individuals have been traced back through at least three (3) succeeding generations. Thirdly, experimentation has been carried on with the breeding of animals and plants. Various types have been bred together to get certain superior types, and the effect of various substances upon the growth of the organisms have thus been discovered.

In 1838 and 1839 the cell theory which states that all living organisms are made up of cellular units, had its beginning. Near the center of the cell is the nucleus surrounded by a nuclear membrane. The nucleus and the surrounding cytoplasm are made up of a living substance called protoplasm. The nucleus is regarded as the chief center of the whole cell, because changes which the cell undergoes seem to be initiated in it, and cells deprived of their nuclei do not survive long. In 1883 Gruber found that in drawing a thin cover glass back and forth in a drop of water containing a collection of the protozoön Stentor, which has a long chain-like nucleus, these tiny animals could thus be cut into fragments. Pieces which contained a fragment of the nucleus regenerated into new Stentors, but relatively large pieces which had no nuclear substances very soon disintegrated. During certain phases of cell life the chromatin, of which the nucleus is made up, masses itself together into definite bodies called chromosomes. In the various cells that make up the individuals of any one species, these chromosomes appear to be practically constant in number except in connection with sex.

In the cytoplasm of an animal cell is also found a tiny body called the centrosome. This plays an important part in the life cycle of a cell, for it becomes the focal point of peculiar radiating lines, in a period of cell division. Every cell passes through a cycle of life similar to that of man.

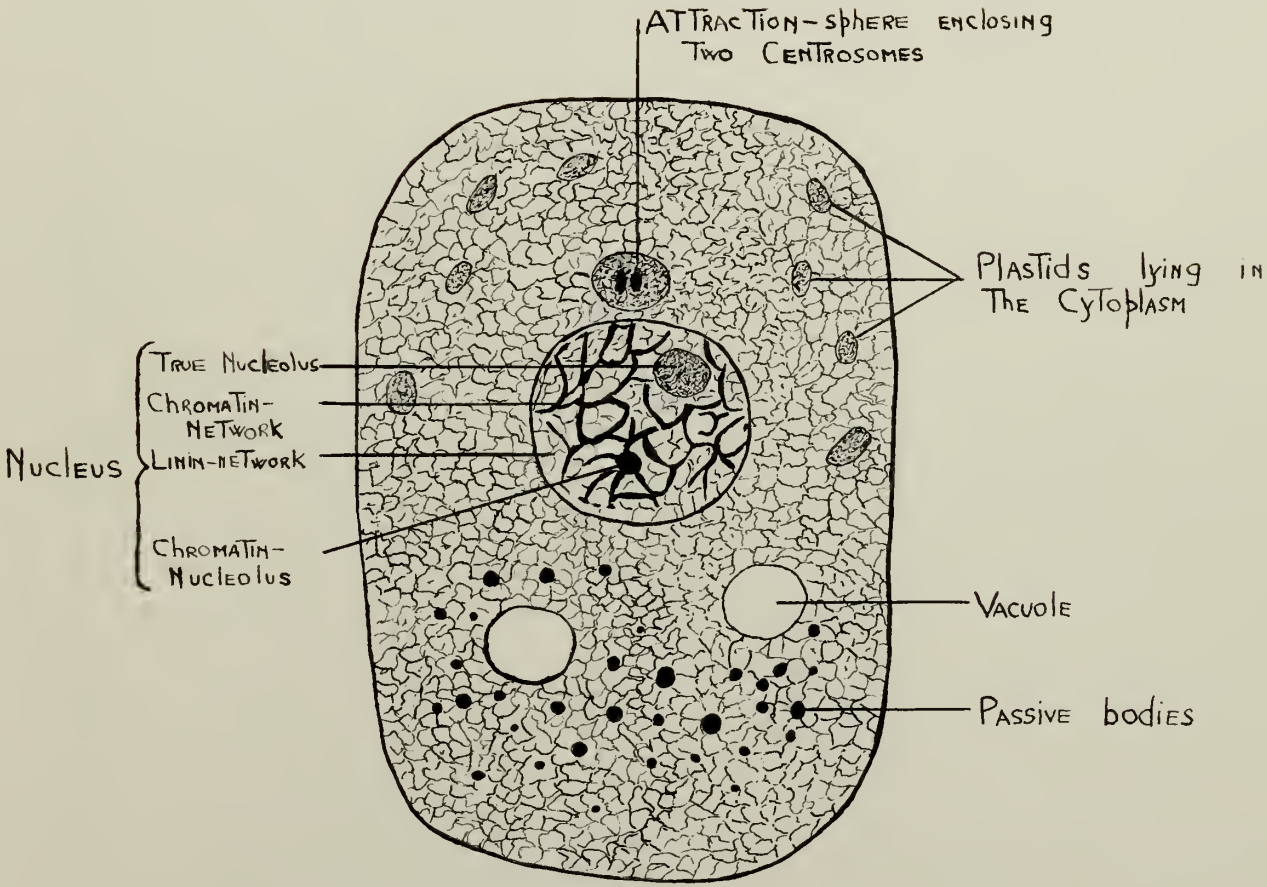


DIAGRAM of a CELL

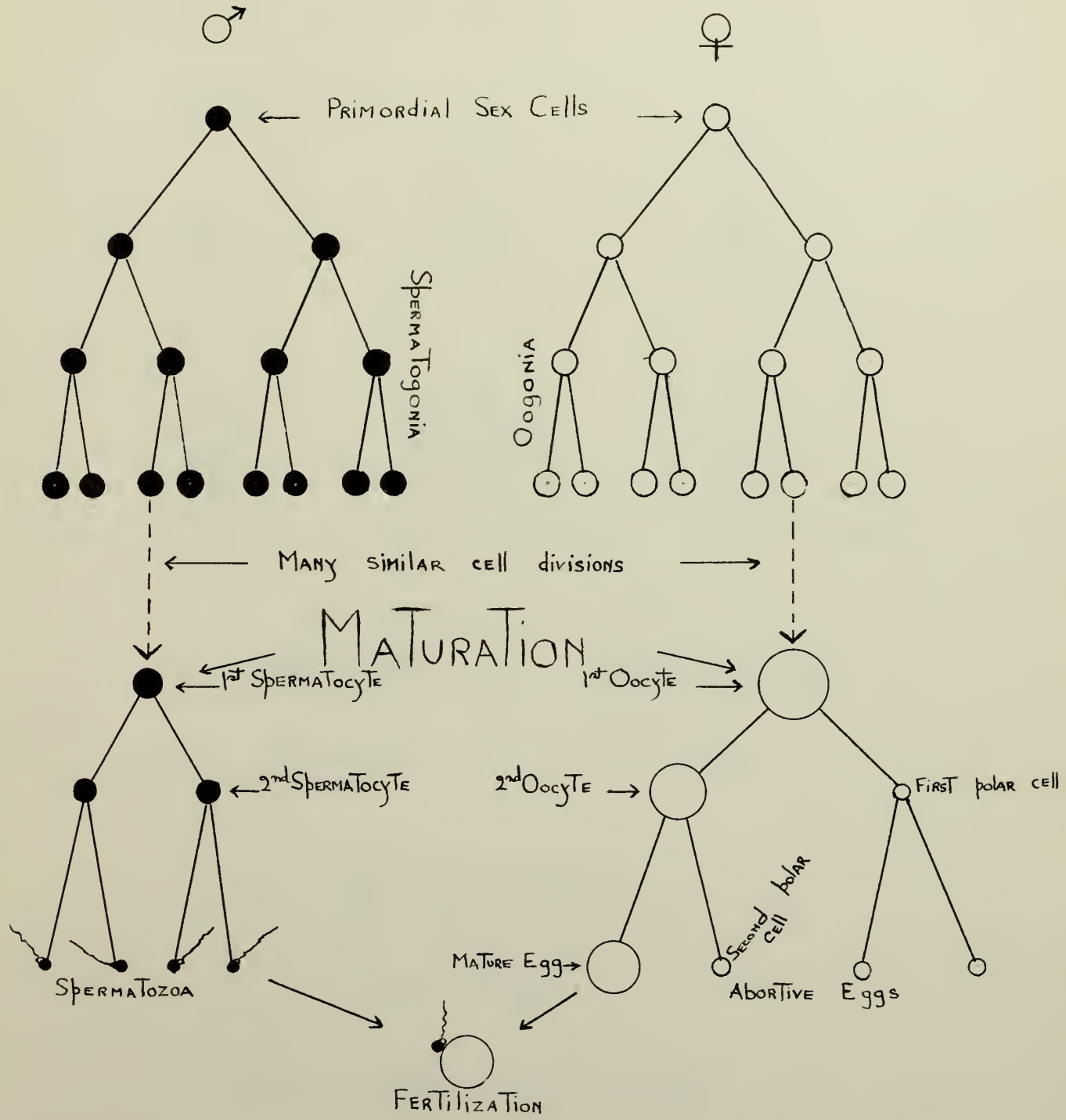
It is born from another cell, passes through a period of growth and developement, gives rise to daughter cells, and old age and death complete the cycle.

In types of organisms that reproduce sexually there occurs a differentiation of the body substance into somatoplasm and germplasm, as Weissman terms them. The somatoplasm includes the general bulk of the individual, that is the body tissues, while the germplasm is the tiny fragment that bears the power to duplicate the whole organism, and that is destined to live on and give rise to many new individuals. The somatoplasm is only a temporary domicile for the germplasm.

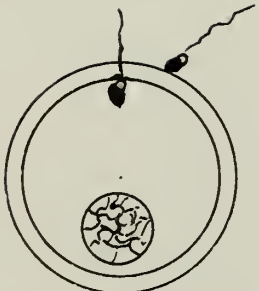
When two cells, the egg and sperm, unite to make one, the process of sexual reproduction occurs. Certain preliminary changes in preparation, occur before the union of the two (2) cells. These maturing changes result in a reduction of the chromosomes in each sex-cell to onehalf their original number and are necessary in order to keep the characteristic number for any species. The mature egg cell or sperm cell, with half its normal number of chromosomes is termed a gamete. The first maturation division, shown in the diagram is reductional, each daughter cell receiving onehalf of the chromosomes, whereas in the second maturation division each daughter cell received one half of each chromosome, these being split lengthwise.

Fertilization occurs when the egg and sperm cells unite to form one. The egg cell is much larger in size than the sperm cell and from the union of the two (2) cells the new individual is developed.

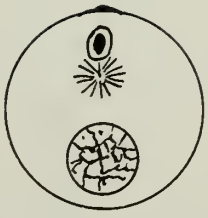
Certain investigators have considered the chromosomes that we find in the nucleus of the germ cell as the carriers of heredity or the determiners of the individual that differentiate him from some other. The only features essentially alike in both the germ cells are the chromosomes. The inference



MATURATION of GERM-CELLS



Entry of Sperm



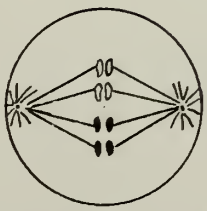
Loss of Sperm Tail

Division of Centrosome

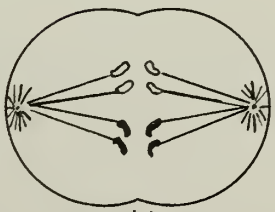
Approach of Sperm Nucleus

Increase of Sperm Nucleus

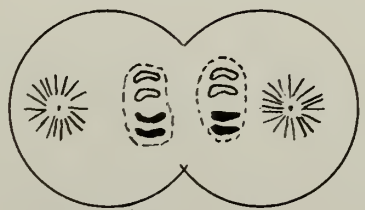
Formation of Chromosomes



Splitting of Chromosomes



Anaphase



Two-celled Stage

FERTILIZATION

is, then, that they bear the determiners which are the factors that cause adult characters in heredity. The existence of an extra chromosome in the male cell helps to strengthen this hypothesis. The process of maturation is not concerned with any cells but the germ cells and in this process it is the chromosomes that figure so prominently. Their behavior during maturation brings together hereditary determiners out of partial contributions from each parental source. Evidence of a definite causal connection between certain chromosomes of the germ cells and particular somatic characters has been furnished by certain critical experiments upon the eggs of sea-urchins. Boveri found that he was able in some instances to shake out the nuclei bodily, chromosomes and all, from the mature eggs of the sea-urchin, Sphaerechinus and when there was added in sea water to such enucleated eggs, the sperm cells of an entirely different genus of sea urchin, the Echinus, the sperm cells of the latter entered the Sphaerechinus eggs which had been robbed of their nuclei, and from this peculiar combination larvae developed which exhibited only Echinus characters.

It is objected that there always exists an intimate physiological relationship between the nucleus and the cytoplasm, and that it is unreasonable to expect the isolation of one from the other, since the two (2) must act together as parts of an organic cell.

The biochemists seek to find the carriers of heredity in the chemicall nature of the cell. The blood of greyhounds and dachshunds is chemically different, although from a morphological view point apparently identical. The chemist explains many chemical actions by the enzymes and Montgomery suggested that the chromosomes themselves might be masses of enzymes. The chromosomes with certain chemical reservation are no doubt the morphological carriers of heredity.

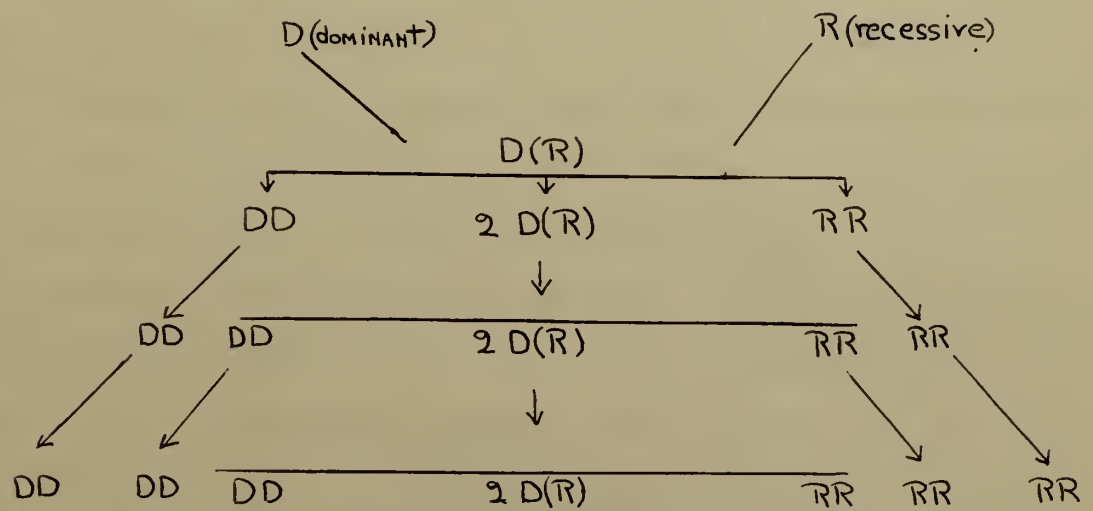
One glance at our friends and daily associates gives us an idea of the vast difference in physical, mental and moral traits. Their eyes may be blue, brown, black, or green; their hair yellow, red, black, or brown and straight or curly and their noses long or short. Some have quick hearing and others dull; some have musical ability, others none. The disposition may be cheerful or melancholic. Because there is this vast diversity of characteristics we have a basis for the belief that it is practical to improve the qualities of the "human harvest." These characteristics are inheritable and independent of each other. The method of inheritance is not an easy one to determine. Inheritance is not of the whole individual, but simply of certain unit characters. The theory of independent unit characters has an important bearing upon the classification of human beings. A large part of the time and expense of maintaining the courts is due to the antiquated classification with its tacit assumption that each class stands as a type of men. There are extended discussions in courts as to whether "A" belongs to the white race or to the black race or whether "B" is feebleminded or not. If they attempt to define the terms the situation is only rendered worse. One expert may define a feeble-minded person as one incapable of protecting his life against the ordinary hazards of civilization, but this is vague and the test is constantly changing. For instance a person might be quick-witted enough to escape being run over by a horse and carriage, but not quick enough to escape an automobile. A second expert might classify a feeble-minded person as one who cannot meet all of the Binet test for three (3) years below his own. Every attempt to classify persons into a limited number of mental categories ends unsatisfactorily. No person possesses all of the thousands of unit characters, and without some of them we are certainly better off, but the lack of others is a serious drawback. If we place under the feebleminded those who lack some known mental trait, the class is altogether too inclusive

or if we have it include only those lacking some trait desirable to social life, again we find it far too inclusive.

Because "organic resemblance is based upon descent", offspring are material continuations of their parents and consequently may be expected to be like them, It is often thought therefore that "like produces like", but this by no means always fits the case. Two brown-eyed parents often produce blue-eyed children, although brown-eyed children would be more usual. Breeders of animals and plants often have this difficulty of getting them to "breed true." Because of these variations, however, improvement can be surely gained. If all organisms did "breed true" there would be no evolutionary advance. Thus the fundamental factor in heredity is this process of variation. First of all the problem has been attacked by collecting masses of data. To accumulate this data demands a culture through many generations, under most rigid control, of the largest possible number of plants and animals. This means long periods of work and great patience, as well as many workers. The most conspicuous working hypothesis at present is Mendel's law. This Austrian monk, who worked in his garden in the monastery during the middle of the nineteenth century left on record a law of heredity. This record was lost until ten or fifteen years ago, when the modern movement in experimental evolution became most strenuous. Mendelism has extended from its simple original statement into a speculative philosophy with conceptions of unit characters, dominance and ratios. The fundamental idea is simple enough however. If two (2) different species are crossed the result is a hybrid which combines certain characteristics of both parents. When this hybrid propagates the progeny split up into three (3) sets; one resembling the hybrid parent, and the two (2) other sets resembling the parent forms that entered into the hybrid. Mendel's law is a statement of the definite ratio expressed by these three (3) groups of forms derived

from a splitting hybrid. This means that in a series of generations initiated by a hybrid, approximately one-half of the individuals of each generation will represent the hybrid mixture, one-fourth of the individuals will represent one of the pure forms that entered into the hybrid and the remaining fourth will represent the other pure form. The use of such hybrids is simply a device to secure ready recognition of the contributions of each parent to the progeny. For example if red and yellow varieties of corn were crossed, it would be a simple matter to recognize the color contribution of each parent to the progeny, when it would be impossible to trace it in two (2) yellow varieties. The inference is that what is true of hybrids may be regarded as laws of heredity in general. In one sense every union of parent forms is hybridizing, for each parent has its own individuality.

The essential feature of Mendel's law is, briefly stated, this:heredity characters are usually independent units which segregate out upon crossing, regardless of temporary dominance.



General Mandelian Formula for a Monohybrid.

Much of the variation in nature is easily apparent, but some requires a trained eye. A flock of sheep may all look alike to a passing stranger but not to the man who tends the flock. The key to Japanese art as pointed out by Dr. Mitobe consists in being natural and in faithfully copying nature. It is thus that the Japanese artist makes each object that he produces, unique, because nature herself, whom he seeks to follow, never duplicates anything. The Bertillon system of personal identification is based upon the constancy of minor variations found in each individual. Criminals can be traced by their fingerprints. Variation may be of many different kinds. The biometricians, the pioneer of whom was Sir Francis Galton, have sought to work out these biological facts by the application of statistical methods. It is essential to go beyond the fact of variation and deal with the apparent evidence as presented through statistical analysis, but statistical methods would not alone be sufficient.

The oldest known authenticated case of a plant mutation is the often cited case of the fringed celandine, which appeared in the garden of the Heidelberg apothecary Sprengel, in 1590. This fringed celandine bred true at once and at present is a wide-spread and well known species. The purple beech has appeared historically as a mutant among ordinary beeches upon at least three (3) occasions in widely separated localities, and has always given rise to constant progeny. Perhaps the best known plant mutations are the progeny of Lamarck's evening primrose, and because of these flowers De Vries formulated his mutation theory. It was believed that this plant was a native of the southern U.S. although at present, as far as known it is extinct in its wild form. It was exported to London as a garden plant about 1860 and spread from there about the continent and in some places became wild. Near Hilversum, a few miles from Amsterdam in an abandoned potato field Hugo De Vries found it in 1885. He found two (2) entirely new mutants that were unknown in

the great botanical clearing houses of of Paris, Leyden, and Kew Gardens. Mutations are far more common than has been generally supposed.

In 1791 Seth Wright, a Massachusetts farmer, discovered in his flock of sheep a male lamb with a long sagging back and short bent legs resembling somewhat a German dachshund. He brought up this strange lamb because it could not jump fences, and it became the ancestor of the Ancon breed of sheep. Later this breed gave rise to another mutant, the Merino, which produces a superior grade of wool. Hornless cattle suffer fewer injuries than horned cattle. In 1889 in Atchinson, Kansas, a mutant among horned stock appeared and has given rise to the Hereford breed of hornless cattle. Taillessness in cats and dogs is common. The causes of mutations, since they occur regardless of environment are of a germinal nature. Evening primroses display the same mutants in America or Holland, cultivated or not. It has been suggested by Standfuss that species may undergo a life cycle like that of individuals. As shown in the figure they are born of other species and pass through the period of infancy and youth that are characterized by much fluctuation. With maturity they gradually become comparatively stable until the reproductive period is reached, when they throw off their progeny as on a tangent. They finally pass into the period of old age, from which there is no recall, although they approach in many features the infantile condition, and end in death or extinction. This cycle is shown repeatedly by phylogenetic lines of fossil forms which have long since become extinct. The reproductive period of a species when mutants are being thrown off, as of an individual, may extend over a considerable period of the whole cycle, or it may be confined to a relatively small segment. It is possible that in the evening primrose, De Vries may have caught a plant passing through the crucial period of species reproduction. Mutations may be the results of hybridization appearing as Mendelian recessives after crossing. The bearing of mutation upon heredity lies in the fact that

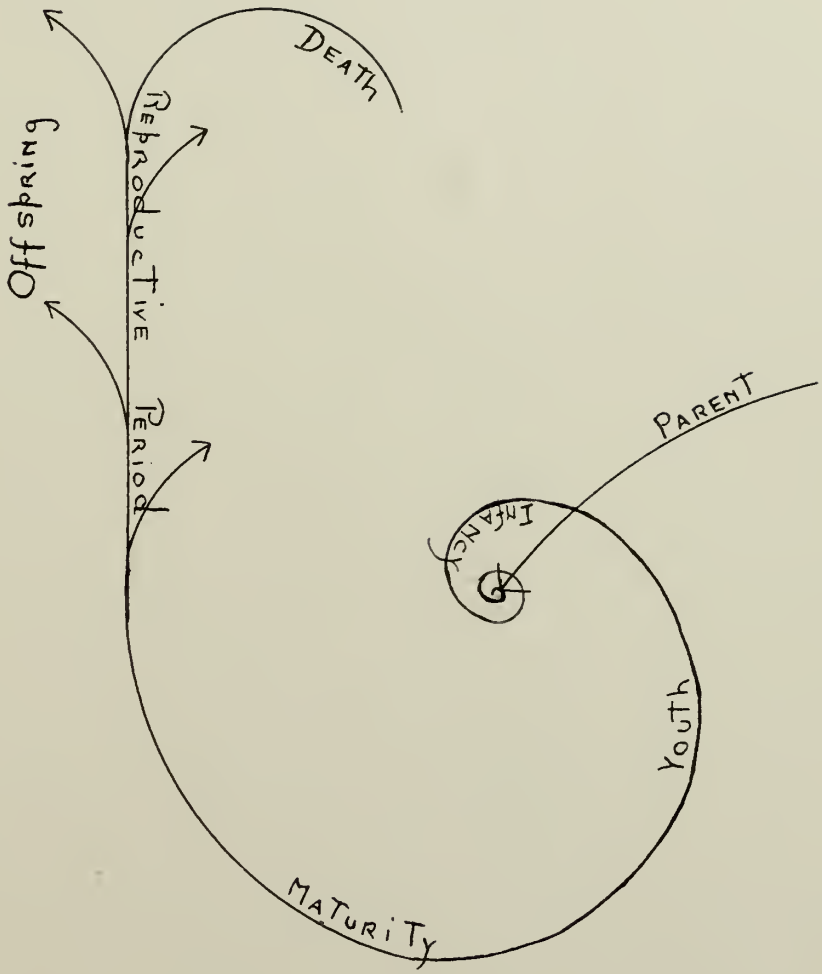
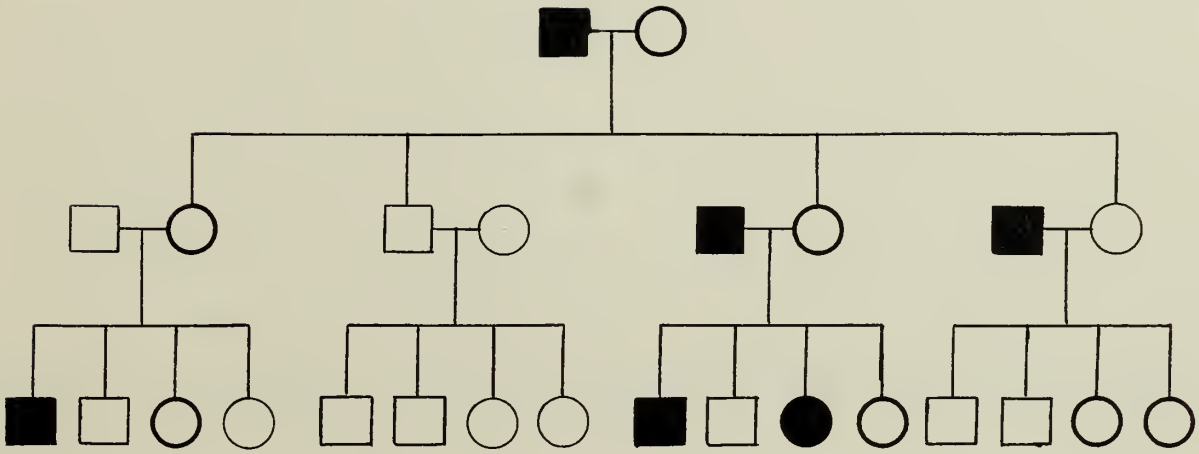


DIAGRAM of the RELATION of REPRODUCTION to the LIFE-CYCLE

contrary to Darwin's belief, it is apparently mutations and not fluctuations that make up heritable variations.

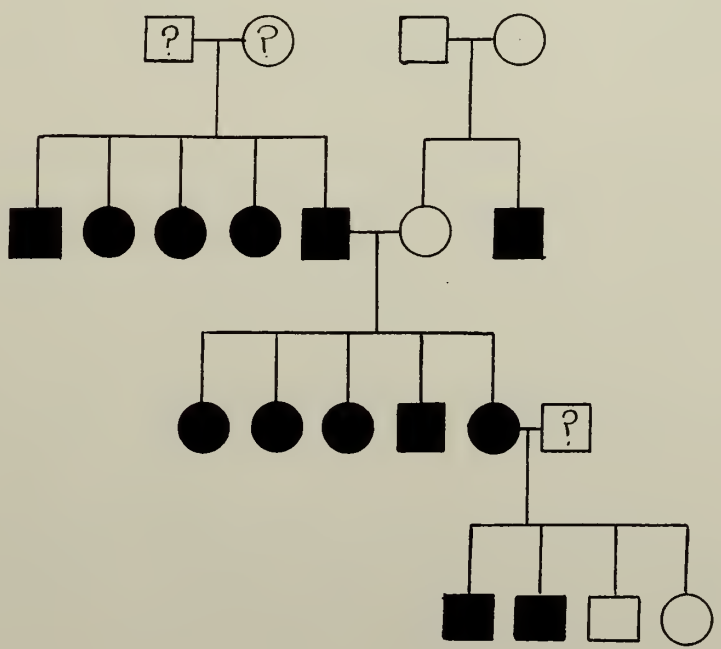
It has been more or less a general desire for centuries to control the sex of an unborn child. This is especially desired by breeders of animals. There has been no lack of speculations concerning the determination of sex. The number has advanced well into the hundreds. Hippocrates thought the vigor of parents was accountable and Sadler dreamed that the relative ages of the two parents is the determining factor. Schenk gives us a bit of folk lore from Servia. If a man has a stye on his eyelid he comes to the conclusion that his aunt is an expectant mother. If the stye is on the upper eyelid, the child will be a male; if on the lower, a female. Modern theories come under two heads; those that consider sex as dependent upon controllable external or environment factors as food, climate and will power and those that consider sex beyond control, that is, dependent upon internal factors in the germplasm. It is easy enough to get evidence for various speculations for fifty per cent of the cases will likely be correct, since the two sexes, are approximately equal in numbers. Some statisticians have shown that in the time of war that when mothers had less nutritive food, that the preponderance of children were males. By statistical methods it is found that there is produced a practical equality in the number of the two sexes. Oesterleben in Europe summarized the data for nearly sixty million human births and found an average of one hundred and six males born to every one hundred females. The essential difference between a male and female is that the former produces sperm, the latter eggs. All other differences are secondary and largely dependent upon this difference. In higher animals if the sex glands are removed from the individual, the superficial differences between the sexes largely disappear. In considering the reproductive function, the female is the equivalent of the male organism plus an additional function, of supplying the embryo with food. In practice the better



Darkened areas signify Color-blindness

Heavy rings signify simplex females

Squares signify males



INHERITANCE of COLOR-BLINDNESS

nourishment of the mother may lead to the production of more eggs, but it is not believed that it leads to more females.

Color blindness in man is a sex limited character. It is far commoner in men than in women. A color-blind man does not transmit color-blindness to his sons, but only to his daughters and they are normal provided the mother was, yet they transmit color-blindness to half of their sons. A daughter to be color-blind must receive the character from both parents, while the color blind son receives the character only from his mother. The following table shows the inheritance of color-blindness according to the sex-limited interpretation.

Parents.		Expected Offspring.	
♂	♀	♂	♀
Normal	Color-blind	Color-blind	Carrier
Normal	Carrier	½ color-blind ½ normal	½ carrier ½ normal
Color-blind	Normal	Normal	Carrier
Color-blind	Color-blind	Color-blind	Color-blind
Color-blind	Carrier	½ color-blind ½ normal	½ color-blind ½ carrier

The determination of sex depends generally upon the inheritance of a Mendelian factor differentiating the sexes and so it is highly probable that it will never be possible that the breeder control sex. Only in parthenogenesis can man at will control sex and until he can produce artificial parthenogenesis in the higher animals, he can scarcely hope to conrol sex in such animals.

The Mendelians teach us that their "factors", the units of which we are made, are often intertangled or mutually repellant. If such and such goes together into the germ-cell, so must something else; or sometimes if one, then never the other. There may thus be naturally determined conditions of absolute womanhood. One may be externally a woman yet lack certain of the fractional constituents, which are necessary for the perfect being. Complete

womanhood, like genius, depends upon the co-existence of many factors, some of which may be coupled and segregated together in gameto-genesis, while others may be quite independent, only chance determining the position of them. The question of incompatibility or mutual repulsion is of serious concern as for instance if it were the case, and the illustration is not overdrawn, that the factor for the brooding instinct and the factor for intellect can scarcely be allotted together to a single cell.

This question of compatibilities is well shown and strikingly so in the case of the worker bee. Mendel's own laborious work upon bees was lost and little has been done since. The worker bee is an individual of a praiseworthy and admirable kind, from whom mankind can yet learn a thousand truths. She is distinguished primarily by the rare and high development of her nervous system. In terms of brain and mind, she is almost a paragon of animals says Dr. Salesby. The ancients supposed that the queen bee was indeed the queen and ruler of the hive. Here they thought was the organizing genius, the forethought, the exquisite skill in little things and great, upon which the welfare of the hive and of the future of the race depended. In point of fact, however, the queen bee is a fool. Her brain and mind are of the humblest order. She never organizes things, nor does she even rule herself, but rather does as she is told. S he is entirely specialized for motherhood, but the thinking and the determination of the conditions of her motherhood are in the hands of other females, also highly specialized and certainly the least selfish of living things, for they themselves are sterile and incapable of motherhood. It may be the conditions of nourishment, the conditions of environment or education, which determined whether the young creatures would be queens or workers, sterile wits or fertile fools.

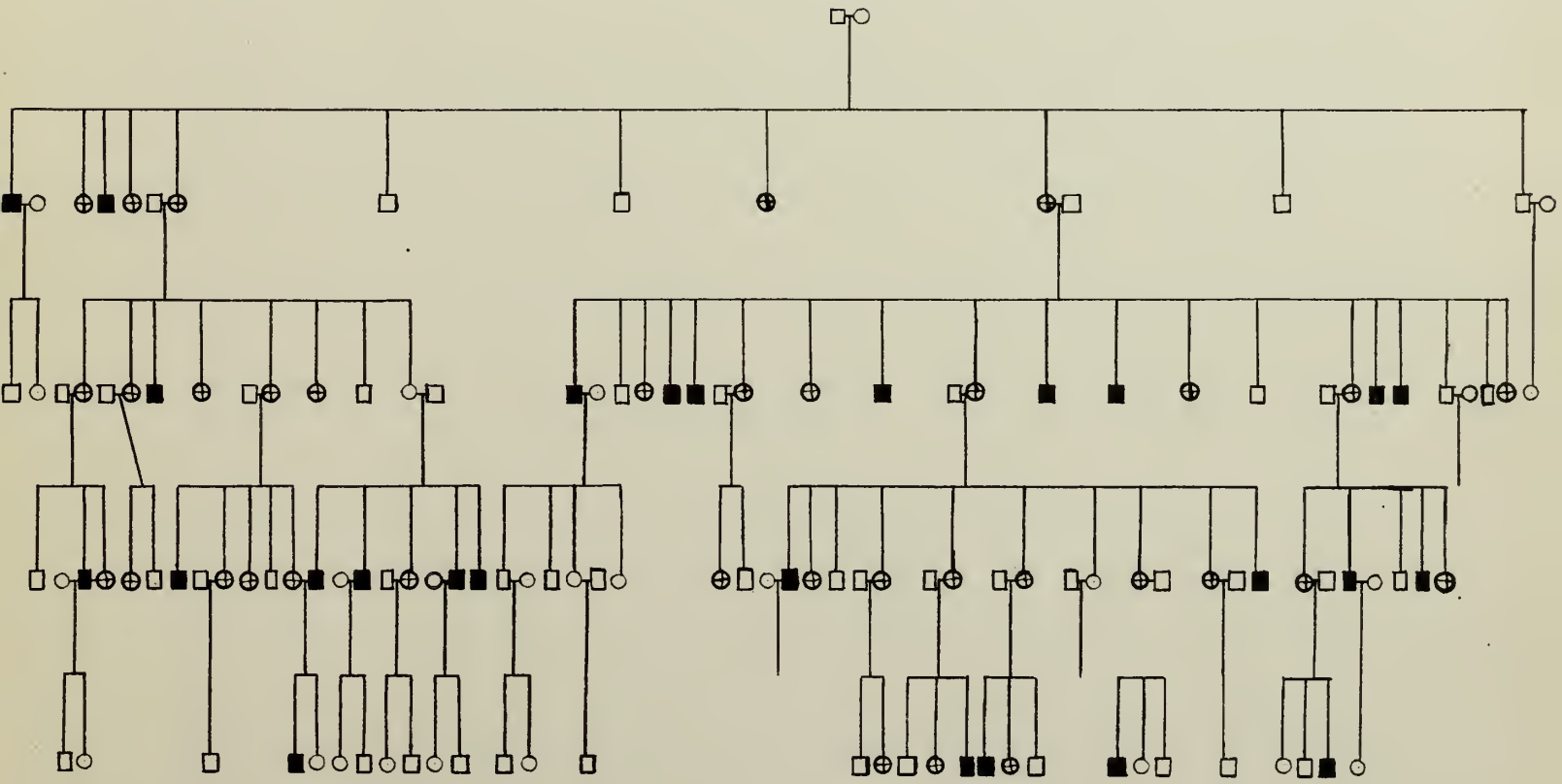
One of the modern laws of heredity is that nothing is inherited except

the determiners in the germ cells. The possibility of the inheritance of somatic mutilations depends upon their capacity to modify the determiners in the germplasm and such capacity has never been conclusively proved. The germ cells are fed by the blood which may carry poisons and hence arises the possibility of the lowering of the value of the germplasm.

Both germ cells that unite may bear the determiner for a unit character. In the child there will be a double stimulus to this characteristic or the character is of a duplex orogin. If but one parent has the determiner the characteristic is of simplex origin and would be often less perfectly developed than the one of duplex origin. A person, who shows some character in his body or soma may not have a determiner for that character in all of his germ cells, but if a person is lacking in a given unit, the determiner is usually lacking in all of the germ cells. In the Mendelian analysis the absent character is referred to as a recessive and the present character, the dominant: in a cross of the two we get a heterozygous offspring.

The sex limited inheritance is shown in the inheritance of hemophilia. The male parent is characterized by the absence of a character of which the determiner is typically lodged in the sex chromosome. The trait appears only in the males of the family and is not transmitted by them, but is transmitted through normal females of the family. The abnormality is present in the female but it is latent or in Mendelian terms recessive. In the chart it is shown that the individuals with this disease are males and that their sons do not have it.

The inquiry concerning the inheritance of acquired characters has been called by Professor Brooks, "the interminable question". For some ages it was a general belief that acquired characters were inherited. Lamarck made this idea the corner stone of his theory of evolution. Darwin also believed



■ = Individuals with Hemophilia

⊕ = Normal Females Who Transmit Hemophilia

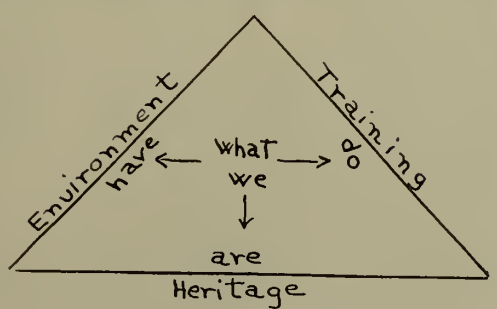
PEDIGREE CHART of HEMOPHILIA

they were inherited, but in 1875 Sir Francis Galton became skeptical on the matter. Weismann defined an acquired character "as any somatic modification that does not have its origin in the germ plasm."

Modifications of the germinal material are the basis of permanent departures from the racial mean, and, at present, the methods of production and the cause of germinal variations are of practical interest and theoretical importance. Germinal variations have been suggested to arise by five main methods. First they were suggested as a result of the direct action of external forces. Second natural selection has been suggested, but not proven to result in germinal variations. Third hybridization is known to be productive of germinal variations, and in domesticated organisms a considerable number of useful forms have thus arisen. Sometimes these commercial hybrids appear inconstant and are perpetuated only by cuttings from the first generation and if seeds were formed they would revert to the types from which they arose. Hybridization is, however, a potent means of creating new and diverse combinations of existing qualities and attributes, which may account for no small portion of the species in nature, as well as in domestication. Fourth the production of germinal variations may occur by combining slightly different conditions of the same attribute in the zygote. This process of amphimixis has no evidence to support it directly. Fifth, the operation of orthogenesis. This is the origin of new forms, whether by natural selection or mutation or neither, that are the result of a persistent determinate variation. For example, the history of such a group as gymnosperms shows a tendency to vary in certain definite directions that has persisted from the early Paleozoic to the present time. In all of these modes of the origin of germinal variations two groups of factors are involved: first, the physical constitution of the material with its array of qualities, attributes and conditions and second,

the incident forces from without the germinal material. As far as experience allows of a conclusion, all variations arise primarily in the germ and appear secondarily in the soma.

In the words of Sir Francis Galton who devised the term eugenics, it is "the study of agencies that may improve or impair the racial qualities of future generations, either mentally or physically." It is the Science of the improvement of the human race. It seeks to make the coming individuals the strongest, the best to meet all demands placed upon them. The eugenical standpoint might be compared to that of the agriculturist, who recognizes the value of culture, but realizes that the permanent advance is to be made only by securing the best blood. The triangle of life may show three important factors that determine the characteristics of an individual.



The important one is the heritage and is recognized as of greatest importance by all students of heredity. Heritage or "blood" expresses the innate equipment of the individual. It is what determines whether he be beast or man. In this triangle of life, heritage is the base upon which the other two factors rest.

Marriage can be looked at from many standpoints. In a novel it is the climax of human courtship; in law it is the union of two lines of property descent; in society it is the fixing of a certain status, but in eugenics it is an experiment in breeding and the children are the result. In the case of animals and plants it has become a true science in breeding pure stocks, but in

man it is still but experiment. The success of marriage by the eugenist is measured by the number of disease resistant offspring that result.

Every year about fifty million children are born into this world. In our United States annually appear around two and one half million children. Nearly one-half million die before they become one year old and half of all have died before they become twenty-three. Out of the one and one quarter million left, only a small percent are well equipped to play an important role in the United States. About forty thousand each year will be ineffective through temporary illness, four or five thousand will be segregated in the care of institutions, unknown thousands will be kept in poverty through mental deficiency, other thousands will be the cause of social disorder and other thousands will be required to care for the weak and unruly. It is hardly fitting that intelligent people should have to support about one-half million insane, feebleminded, epileptic, blind and deaf, eighty thousand prisoners and one hundred thousand paupers, at a cost of over one hundred million dollars per year. At present through the agencies of charities, which perpetuate the weak, through war which eliminates the strong and through education which makes celibacy a condition of success, we are in a degree reversing the processes of natural selection.

The general problem of the eugenist is clear. Young people should be induced to fall in love intelligently and the mentally incompetent should not be permitted to give life to new mentally incompetent individuals. This science must study the laws of inheritance of human traits and as far as these laws are ascertained to make them known. The eugenic legislation in most states is useless and the friends of eugenics should stop promoting the greater part of it. Where it has been tried, it has rarely been enforced absolutely. The greater energy should be placed upon the broad constructive policy for the

furtherance of eugenics. Research work in heredity is needed and the best method is to create a "eugenic conscience" in all young people and in the public in general, so that they will guard against unfit matings. The future fathers and mothers should be instructed in the laws of parenthood and in the purity of sex relations. It is necessary to abolish transmissible diseases, produced by sexual vice, by prohibiting marriage or marriage relations between the unfit. Eugenics desires that better people become better parents of better children. The world would then be renewed with offspring from its strongest and best stocks.

Dr. John F. Bobbitt says, "Families of the better class are smaller than formerly. College graduates of today average considerably less than two children per man, whereas in the laboring population the average is twice as great. The more highly endowed classes furnish a far smaller proportion of the parentage, than is furnished by the stupid, unambitious, poorly endowed strata at the bottom. A bility is dying out at the top, simply because it is not born. On the other hand many influences are at work to protect the weaker and poorer social stocks and to enable them to have larger families than in the past ages. Our medicine, hygiene and public sanitation keep alive multitudes of weaklings that formerly were weeded out by hard conditions. Thus today we save weak lungs, weak muscles, weak eyes and ears, weak minds and weak wills, weakness in general and weakness in every particular, further corrupting the next generation. This cutting off at the top of the best and adding in at the bottom of the worst and poorest is at present exhausting the high qualities of our race with a rapidity never before equalled in the history of the world."

Eugenics has given its first care to training future mothers. Motherwork has been taught in L'Ecole des Meres in Bordeaux since 1897 and also in the Association of Housekeeping Centers of New York City. These institutions should seek as a goal that no girl should lose her virtue through ignorance and weakness, that none should enter marriage without definite preparation and

that ideals of purity, parenthood, and public service by giving birth and maturity to sound, well nurtured children should be generally exalted. A similar program is sought for boys. They should be informed of the nature, purpose and control of the sex functions before they mature and of the peril of their abuse. The Chicago Commission on Vice concluded that the education of men was necessary.

Galton recognized the vast differences in human stock and the great value of fine people to a nation. He argued that we must encourage parenthood on the part of persons belonging to good stock and discourage parenthood among defective individuals. The former is positive eugenics or the encouragement of worthy parenthood and the latter negative or the discouragement of unworthy parenthood.

The Mendelian Americans have advanced in the last few years in the problem of positive eugenics and upon the simpler qualities. The inheritance of the valuable characters, however, has not been discovered carefully, so that as yet they can not be produced with special matings. The reason is due to the complexity of valuable characters. It is possible that the absence or presence of only one genetic factor may in certain cases constitute the difference between the feeble or the normal mind; or the deaf and the hearing ear; but it is very certain that conscientiousness, for instance, cannot be so traced. The most admirable mental qualities are complex owing their appearance to the harmonious co-existence of more factors than one in the genetic constitution of the individual. As Professor Bateson says, "There is as yet nothing in the descent of the higher mental qualities to suggest that they follow any simple system of transmission. It is likely that both they and the more marked developements of physical powers result rather from the coincidence of numerous factors than from the possession of any one genetic element." Any

musician knows how rare and complex is a complete musical endowment. The prospects of positive eugenics are gravely qualified by such complexities. If each unit forming one of these complexes follows the Mendelian law in the transmission, one can see how seldom hopes could be realized, for it cannot often chance that all the necessary units come together again in a germ cell. There are also numerous possibilities of the offspring, that depend upon the particular constitution of the germ cell with which the first is mated. Therefore we are disappointed in the offspring of distinguished persons, for their offspring may be most ordinary. As a result we have great rarity of genius. If it depended upon the presence or the absence of a single genetic factor, or even two or three, it would be common. Positive eugenics cannot promise too much. Galton's "Hereditary Genius" from its name gives us rather a wrong impression of the book, which shows the inheritance of ability rather than real genius. Ability is, of course, far more common than genius. Two notable "experiments" in positive eugenics were made in the 19th century. If the illustrious parents could have had perhaps 1000 offspring, one of them might have been all we could ask for. Families are so small that even when genius is mated with genius, genius does not result. Robert Browning married another poet and their son, now dead, was most commonplace. Richard Wagner married the daughter of Liszt and their son Siegfried Wagner inherited musical ability of no common order. He is a competent composer and conductor, but that tremendous quality, the supreme genius that was present in his father is lacking. The breeding of genius fails.

Positive eugenics cannot pretend to apply laws that will produce Shakespeares and Raphaels and Napoleons. Certain types of mental deficiency, because they are simple characters can be bred out. It is not enough that a man marry but he must marry the right person. Positive eugenics,

directed to the production of special valuable qualities, near the genius line, would have to dictate beyond all possible limits. If positive eugenics can only raise the average, there will be more likelihood of talent and genius arising therefrom.

The best parental age is a question for positive eugenics. All varieties of answers, based on single cases have been suggested. The marriage age at the present time has been constantly rising. Conditions of life have required a higher cost of living and the young man cannot get a foothold, until later in life. Statistics have sought to compare first-born children with later ones, but no definite result has been accomplished and statistical treatment of the matter seems to be an impossibility. In some cases first-born children are the poorest stock of the offspring, but if a racial poison as alcohol or lead has been introduced, we know that the earlier children will be the least injured.

Negative eugenics means merely the discouragement of unworth parenthood and not by any means the killing off of life by infant mortality or by any kind of active interference with ante-natal life. "Eugenics has nothing to do with death," says Dr. Saleeby, "but everything to do with life." The eugenist desires only that an unworthy individual should not become a parent, if his unworthiness is of a transmissible form. The elimination of the unfit affords the only natural explanation for the existence of fitness. The only possible control which mankind can exercise over the production of improved races of lower organisms or of man lies in the elimination from reproduction of the less favorable variations which are furnished by nature. Although environment exercises a great influence over the developement of the individual, its influence on the germplasm or the hereditary characteristic of the race is relatively slight and in general not of a definite or a specific

character. If the human race is to be permanently improved in its inherited characteristics there is no doubt that it must be accomplished in a way similar to that used by man in the improvement of domesticated animals and cultivated plants. The methods of breeders, however, cannot be applied as rigidly to man as they are to animals, but the value of selection in both cases, as a directing factor in evolution depends on its severity. In the case of man, even the most enthusiastic eugenists have never proposed to cut off from the possibility of reproduction all human stocks except the very best. The great majority of mankind cannot be expected to voluntarily efface itself, so we cannot look forward to cutting off reproduction from all except the best stock.

Another difficulty in breeding a better race of men is found in the lack of uniform ideals. A breeder of domestic animals lives long enough to see them well established, but a devoted eugenist cannot be sure that his or her ideals will be followed in succeeding generations. The father of Simon Newcomb is said to have walked through the breadth and length of Nova Scotia to find a suitable mate, but neither he nor any eugenist could be sure that his descendants would follow a similar course and it is essential to have long continued selection along particular lines if the race is to be permanently improved. Mankind is such a mongrel mixture and it is so impracticable to exercise a strict control over the breeding of men, that it is hopeless to expect to get pure or homozygous stocks except with respect to a very few characters and then only after long selection. Considering all these difficulties, there is no doubt something to be gained by eliminating the worst human kinds from the possibility of reproduction, even though no great result will come from this measure. There is none who does no re-

ceive a faulty heritage in some respect. "There is none perfect, no not one." There are large numbers of people loosely classified as defectives and it is a question whether they are not actually increasing in number. It may be that they seem to be increasing in number. It may be that they seem to be increasing, due to the fact that they are more accurately recognized and classified than formerly. There is no clearly defined class of defectives, but mankind shows all stages from the highest and most efficient individuals down to the lowest and worst. In general all defectives are shorter lived than normals. The worst monstrosities die in the early stages of developement, others live a short time after birth and none of these leave offspring. Only those defectives in whom abnormalities are relatively slight in comparison to the worst ever reproduce. Thus nature has erected a barrier against the propagation of the very worst.

In modern times defectives cannot be destroyed by Spartan methods, so defectives must be kept from reproducing themselves. Many methods have been recommended, but they all come under two heads. First, segregation to prevent the union of the sexes and second, sterilization or other means to prevent conception following sexual union. Such methods if rigidly applied would do away with or at least reduce the number of children with a faulty heritage. We can apply such methods, however, only to those dependent upon public care or upon public charity and in general the birth-rate in this field is not large, so the good done would not be great. The study of heredity shows that the normal brothers and sisters or even more distant relatives of defective persons may carry the defect in their germplasm and may transmit it to their descendants, though not showing it themselves. Such persons are more dangerous to society than defectives themselves, because their danger is not realized.

It is difficult and almost impossible to decide if a given defect is due to heredity or to environment and if it is due to the latter, the methods for its prevention must be different. No doubt there are many environmental causes of defects in children such as infection, malnutrition and injury which have come at various stages in their development.

From the Iowa Institution for Feeble-Minded Children has been supplied this report with figures regarding the mental condition of the parents of the persons, who have been admitted to that institution.

Number of families investigated.....	1701	or 100%
Inmates, who have both parents feebleminded.....	66	or 3.88%
One parent feebleminded and other normal or unknown....	134	or 7.88%
Number with both parents normal.....	513	or 30.16%
Number with both parents unknown.....	876	or 51.05%
Insanity in one or both parents.....	112	or 6.58%

Defects are multitudinous whatever the cause. Even feeblemindedness is by no means simple. Some persons are evidently born fools, some acquire foolishness and some seem to have it thrust upon them. Eugenical explanations are usually far more convincing and accurate than eugenical prophecy.

It is necessary to distinguish between unworth that is transmissible to offspring and unworth that is not transmissible. Medical analysis is very necessary to negative eugenics. A man may be illiterate, because he is incapable of learning to read or because he has never been taught to read. Thus every case of illiteracy or of any other physical, mental or moral trait must be analyzed before we can say that the principles of negative eugenics apply to it. Negative eugenics has no right to insist that unworthy individuals should not live or not marry, but that they should not become parents. Marriage and parenthood must not always be regarded as synonymous. In so regarding it, cruel and unnecessary suffering might be inflicted upon many individuals who might marry and profit by the married state without injury to anyone, if they had no children. There are many persons in the community that are impure dominants

in the Mendelian sense and half of their germ cells carry the defect. According to a recent calculation made in one of the bulletins of the Eugenics Record Office, about one-third of the population in the United States is thus capable of conveying mental deficiency, the insane tendency, epilepsy or some other defect. No segregation will cure this part of the problem, for it is not possible to segregate normal individuals, who merely convey the defect, or to sterilize them. No form of expulsion or legislation is here applicable. The conscience or eugenic sense of such people must be appealed to and although they marry they must be made to realize that they ought not to become parents.

In Great Britain in 1906 a Royal Commission indicated the great need for special attention to the feebleminded, who are the most important part of the problem of negative eugenics. That Commission had none of our later advances, such as Mendelian inquiries into mental deficiency or the work on parental alcoholism, or the results from the application of the Wasserman test for syphilis to cases of mental deficiency. Mental deficiency is a term that covers a variety of defects, various in kind as well as in degree. The offspring of two mentally defective parents are all defectives if both parents display the same kind of a defect. It has been concluded that a large proportion of cases of mental deficiency are really inherited or so-called congenital syphilis. There appears to be some evidence that epilepsy and feeblemindedness in their genetic forms are interchangeable and that either may appear in place of the other.

Dr. F. W. Mott has brought forth a hopeful outlook in his "law of anticipation." He has collected a large number of pedigrees and he infers that insanity which appeared in middle age or later in the first generation, occurs in adolescence in the second, and earlier in the third, so that the stock tends toward a natural extinction. There is difficulty in accepting

such a law and no obvious explanation of it has been given. Alcohol acting by racial poisoning might be responsible. Much would depend on the nature of the matings in each generation. We have learned in studying insanity that at present there is great carelessness in the care of it. Certain people are insane only under certain conditions of vicious nurture and an asylum protects them from this. They are cured while in the asylum and are allowed to go. They again return to old worries, old drinking and the symptoms of insanity return. They may marry and leave defective offspring. Under modern conditions of humane care and wise diet, the proportion of curee in the asylums is steadily rising. Our duty to the present is better performed if the number is large, but the injury to the future is great.

Deaf-mutism is another field for negative eugenics to work in. Dr. Kerr Love has demonstrated a form of deafness that is due to syphilis. These cases have arisen where there has been no history of deafness in the family and they follow the general course of the disease syphilis unless treated. In early adolescence when the youth has just started to earn his own living both ears and eyes may begin to go. Hosts of these cases could be cured if they were known at the start to be syphilis and were treated with salvarsan. In many families deafness descends from generation to generation as a Mendelian recessive.

Preventive eugenics deals with racial poisons. By a racial poison is meant a substance which injures the offspring through the parents and preventive eugenics means to stand between parenthood and these racial poisons. The importance of racial poisons far exceeds that of all other departments of eugenics. In all parts of the world it is recognized now, how important these racial poisons are. The Archbishop of York said that venereal disease, under certain conditions should be a ground for nullity of marriage. The deadliest

racial poison of all is syphilis, which is due to a tiny parasite. It has the most cruel effect upon the offspring of people infected with it. The remedy, salvarsan, was evolved by Professor Ehrlich of Frankfort and Professor Hata of Tokio. The would-be eugenist who ignores biological sciences and despises them and their methods is only a danger. The aims of eugenics are ideal, but its methods must depend on practical knowledge. The creation and use of salvarsan will do more for the physical, mental and moral health of the race than all other eugenic measures put together. The eugenist owes much to the famous dramatists Ibsen and Brieux, who bravely dared to deal with this question of venereal disease. Mr. William Archer says, referring to Ibsen's "Ghosts", "I venture to prophesy that it will long be remembered and honored as the first great plea in imaginative literature for the coming science of eugenics. It is more than that, much more; but that it certainly is."

Gonorrhoea is another of the racial poisons. It is the chief cause of so-called congenital blindness and because of it sterility results in many cases and a killing of the race. These racial poisons destroy many degenerate stocks but they also make degenerates.

Lead is another cruel racial poison. Women are peculiarly susceptible to plumbism and there are appalling effects upon their children. They have been excluded from the white lead industry. Others in the world can help in the fight against this evil by not patronising the lead glazed china. All public conveniences should be made of the leadless glaze. An electrical or electrolytic bath will rapidly remove large quantities of lead from the body. It is required that men working with lead should have a weekly bath in order to remove traces of the metal from the skin. It is probable that other metals and metalloids cause racial poisons.

Dr. Mjoen says regarding alcohol, "It is better eugenics to take precautions against brandy than to build asylums for inebriates." The racial action of alcohol depends largely upon the strength of the solution drunk. Dr. Mjoen relates a remarkable Norwegian experience from 1816 to 1835, when the free use of brandy raised the proportion of feebleminded more than 100%. When weak beer was returned to, conditions were improved. He says, "The enormous increase of idiots came and went with the brandy."

Professor Stockard of Cornell University has experimented with guinea pigs and the effect of alcohol upon them. He used guinea pigs, that when normally mated produced normal offspring. The influence of the poison upon each sex was tested separately. The alcohol was given by inhalation only. The animals grew, were healthy in appetite and appeared normal. The offspring were lower in grade than the parent. It seems to be convincingly demonstrated that alcohol may readily affect the offspring through either parent and this effect is almost fatal to the offspring, if the parents have had fairly large doses of alcohol.

Woman is nature's important instrument for the future. The eugenist is interested in her education, her psychology and the conditions under which she chooses the fathers of the future. Ruskin wrote "There is no wealth but life" and eugenics stand for the principles of heredity, the principle that the right children shall be born. It is evident that the facts and principles of heredity lie at the very basis of eugenics or race culture, in any of its forms, practical or impractical. If there were no such thing as heredity there could be no possibility of race culture.

The best nurture is none too good for any human being and everyone is entitled to it. Nurture comes second in modern eugenics, but it is import-

ant to the welfare of the race. Both nature and nurture are important. If a living creature were made of a piece contributed by heredity and a second piece manufactured from the environment, it would be easy to work out definitely which was most important. Every particle of an organism is a product of multiplication in which the two factors, nature and nurture are necessary. Every child needs adequate nurture. Newton was a weakling baby prematurely born and would not have survived without special care.

Nurtural eugenics must include many sciences, as well as mere food. The mother must receive the best of care as well as the child. Many people devote all their energies to the nurtural side of eugenics. They wish to see the world made better, and therefore support charities, uplife movements, philanthropic attempts at social betterment, all of which tend to improve the environment of persons who are living in a bad environment. This will not insure the improvement of the race. The faith of the social worker, the physician or the sanitarian in his method of improving the race is very literally the kind of faith that St. Paul described as "the substance of things hoped for, the evidence of things not seen." Eugenists believe that nurture has an influence upon nature, but this influence of nurture or environment is only one-fifth or perhaps one-tenth that of nature or heredity. The way of improving the race is not through work on bad heredity, but to see that a larger supply of good heredity is made available.

The University of Missouri has been breeding cows in order to see whether the milking capacity is due to heredity or merely due to the good care and food. Cows have been subjected to all sorts of treatment at all ages and the experiment has shown without doubt that the milk yield is a matter of heredity. In plants and low animal organisms the influence of environment is considerable, but it diminishes as we rise higher in the evolutionary scale. Merely because a good environment makes it possible for hereditary

traits to get expression, people jump to the conclusion that the environment created chance for expression. Exercise in the gymnasium increases the strength of a given group of muscles, but this does not go on indefinitely. There comes a time when the limit of ones hereditary potentiality is reached and no amount of exercise will gain another millimeter in the circumference of the arm. A parallel case may be seen in the studying for a college examination. Half a dozen students may devote the same amount of time to studying and cramming to the limit, but they receive widely different marks. These instances show that nurture has had some power in moulding the individual by giving his inborn possibilities a chance to express themselves, but nature has said the first and last word.

Galton studied this matter, concerning ordinary twins and identical twins in order to get light upon this matter. Ordinary twins are brothers and sisters born the same day but from two separate ova that have developed together. Identical twins are from the same egg which splits in two at an early stage in the development. Identical twins are of the same sex and extremely alike. They often lose their milk teeth the same day or may become sick with the same disease on the same day although they are in different places. Galton reasoned that if environment changed inborn characters these identical twins if brought up apart should grow dissimilar as they grew up and if the ordinary twins were brought up together they would grow similar. He collected the history of eighty pairs of identical twins, thirty-five of which cases were accompanied by full details which showed that the twins were as nearly identical in childhood as one could expect to find. Considering the thirty-five pairs, many showed a resemblance of body and mind continuing unaltered up to old age, notwithstanding very different conditions of life. In others a severe disease was sufficient to account for some change noticed.

Other dissimilarity Galton had reason to believe was due to the developement of inborn characters that appeared late in life. He felt justified in concluding, "that the only circumstance within the range of those by which persons of similar conditions of life are affected, that is capable of producing a marked effect on the character of adults, is illness or some accident which causes physical infirmity. The twins who closely resembled each other in childhood and early youth and were reared under not very dissimilar conditions either grow unlike through the development of natural, that is inherited, characteristics which had lain dormant at first or else they continue their lives, keeping time like two watches, hardly to be thrown out of accord except by some physical jar." The unlike twins never become any more alike no matter under what conditions they exist, so Galton concluded that "nature prevails enormously over nurture."

Later interesting work has been done by Professor Thorndike of Columbia on New York school children and especially twins. The children show an appalling amount of eye trouble especially myopia or short-sightedness. They have been examined and studied to see if this were due to too early reading, too long hours of study, amount of time spent out-of-doors and various such causes. Although all the environmental factors have not been examined, it appears that their short-sightedness must be due to heredity.

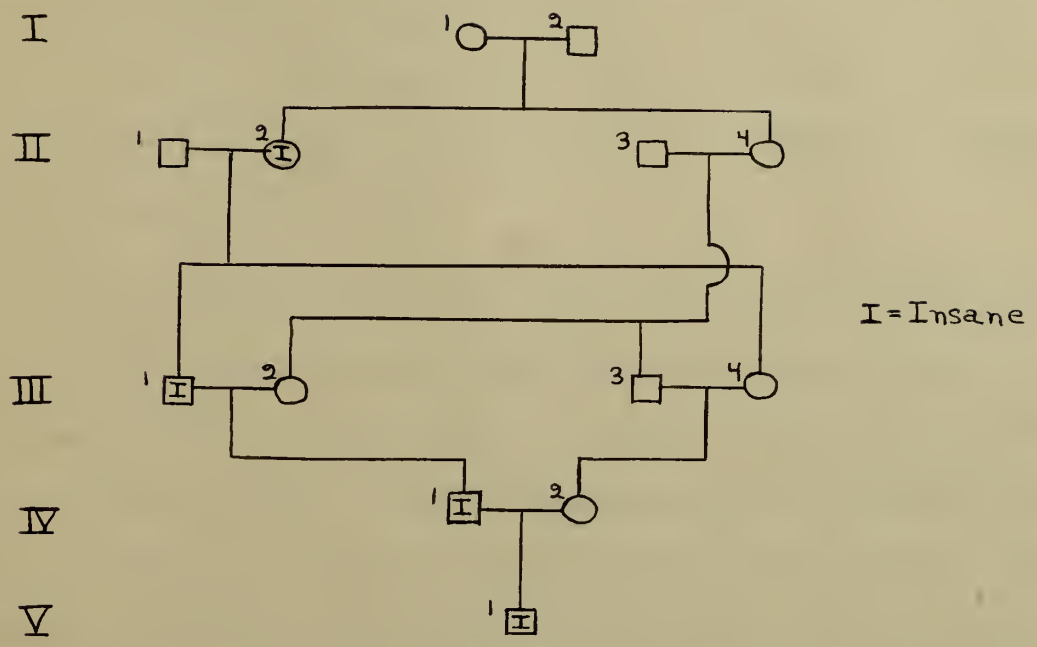
David Heron of London attempted to discover whether healthy children were the most intelligent or not and although none of his work was directly conclusive it seemed to show that heredity was foremost in producing absolute intelligence.

If success in life that comes from great mental or moral superiority is due to the opportunities a man has, than it ought to be pretty evenly

distributed among all the persons who have had favorable opportunities provided we take a big enough number of persons to allow the laws of probability full play. It would be an easy matter to obtain the prizes of life if we only had to give a youth a first-class education and a chance to associate with superior people. When we examine the history of England, as Galton did nearly a century ago, we find success in life is pretty strictly a family affair. The son of a distinguished judge had about one chance in four of becoming himself distinguished, while the son of a man picked at random had about one chance in four thousand of becoming similarly distinguished. Some might object saying that the son of the prominent man had the opportunities and was pushed forward. True genius or worth Galton says will rise despite all obstacles and although family "pull" may land mediocrity in a high official position it cannot make a genius.

Despite the good environment almost uniformly present, the geniuses in royalty are not scattered, but form isolated little groups of closely related individuals. One centers in Frederick the Great, another in Gustavus Adolphus of S weden and a third in William, the Silent. The royal personages, who are conspicuously low in intellect and morality are similarly grouped. There is an inheritance of a neuropathic taint in a highly in bred family, originating with Ferdinand and Isabella of Spain I, 1, 2. The two daughters II, 2, 4, are Joanna who was insane and Mary; II, 1, 3, their respective consorts, Philip, a weak man and Emanuel also weak; III, 1, is Charles V a great ruler but eccentric, cruel, and subject to melancholia; III, 2, is Isabel; III, 3, is John III of Portugal a weak man; III, 4, Catherine; IV, 1, is Philip, morose, sluggish, cruel; IV, 2, is Mary; V, 1, is Don Carlos, "one of the most despicable and unfortunate specimens of

humanity in modern history."



I do not mean to depreciate the importance of a good environment, for we want the best environment that science can produce for us. Karl Pearson has given a good example of a certain workman who found his chisel ineffectual. He hardened, tempered and gave it a good cutting edge on the grindstone and finished it on the oilstone. In ten minutes it was as useless as before. Again he worked on it, using different implements but still it failed him. At this point a German workman suggested that no doubt the steel of his chisel might possibly be at fault. We cannot throw aside the grindstone and the oilstone because they cannot make bad steel into an effective tool, for they are the necessities for the proper working of the good tool. While education and moral and religious instruction may do much to develop one's native traits, heredity can introduce the desirable determiner that will make such training more useful or less necessary. The experience of animal and plant breeders who have been able by fitting crosses to increase the vigor and productively of their stock and crops, should show us that proper matings are the greatest means of permanently improving the human race and of saving it from imbecility,

poverty, disease and immorality. Heredity may limit capacity in one point, but it will increase or extend it in others. One may have mental limitations, but natural health and vigor. There is hardly a strain of human germplasm without some defect or limitation and also without the determiner of some admirable characteristic.

Human society as it exists in the United States is most complex. Our laws naturally assume that all individuals are alike, but admit that some are different and these require special provision. These are the classes that are of eugenic interest. These individuals require an expense of money and time and seem to be the main hindrance to our social progress. They show more clearly inheritance of animalistic characteristics that have been handed down from age to age.

Eugenics depends upon all of the sciences. Forty-five years ago Herbert Spencer showed how the science of society is based upon all the other sciences. The eugenist builds, stands and aspires upon the work of the older sciences, from physics up to sociology. Genetics, the science of heredity is most important.. It is a much younger term than eugenics. In the last year of the 19th century Mendel's work was rediscovered and Professor Bateson was able to lead the way towards a real science of heredity, based upon experimental study, observation and analysis of individual cases. Splendid work is going on here in America along Mendelian lines. The Eugenics Record Office has sent out inquiries regarding musical and mathematical ability and worthy details have been considered. Even with genetic knowledge as to the best matings we have human will to deal with. The most valuable are the least easily coerced or directed. Many do not choose to marry or may leave no children. Sir Francis Galton left no heirs to survive his ideas and work. J. W. Barrie

says, "If we know ourselves well, we know our parents also." This is just another version of the old Shinto maxim of Japan: "Let men know by your deeds who were your ancestors."

If one is fully supplied with a knowledge of the methods of inheritance of unit characters, it might seem to be an easy matter to state how each human trait is inherited and to show how any undesirable condition might be eliminated from the offspring and any wished for character introduced. Unfortunately such a happy state of affairs cannot be achieved for some time yet. We do not know all the unit characters in man and cannot tell in advance which of them are due to positive determiners and which to the absence of such. Unit characters cannot be recognized merely by inspection. The white coat color of a horse is to all appearances a simple character, but experimental breeding shows that it is really due to several independently inheritable factors. Even without a complete analysis of a trait into its units we may still make practical and important studies by using the principle that when both parents have low grades of a "trait-complex" the children will have low grades of that complex.

The way a character is dependent upon a determiner or its absence is of great importance and not easy to anticipate. For instance hair when long as in angora cats, sheep or guinea pigs is apparently not due to a factor added to short hair, but rather to the absence of the determiner that stops growth in short-haired animals. A character can be discovered to be due to a determiner or its absence by noting the effect of breeding likes in respect to the given trait. If all offspring are like the parents in respect to a trait, the simple trait is probably a negative one. If the offspring are very diverse, the simple trait is probably due to a positive determiner and the

germ cells of the parents are of two kinds, some with and some without the determiner. A character due to a simplex determiner, as I have mentioned before, differs very often from one due to a duplex determiner. If the determiner is simplex the character is slow in developing and frequently fails to reach the stage of development that it would, were the determiner duplex. The offspring of red and black-eyed birds may have in early stages a light iris which gradually darkens. This is called the imperfection of dominance in the simplex condition. Although there are numerous difficultues in analyzing the units of heredity and in clearly defining the complications of characters, it is possible to understand the method of inheritance of a great number of human traits and to predict that many more will be analyzed continually in the study of heredity and eugenics.

In order to give definite knowledge to young persons concerning the health and strength of their offspring, one must know the peculiarities of their germplasm, as well as the way in which various characters are inherited. The eugenist is constantly seeking to discover these methods of inheriting the most common and important traits of mankind and many have been carefully recorded.

The color of the eye depends upon the condition of pigmentation of the iris or the colored ring around the pupil. According to Mr. Charles Roberts, the iris has on its inner surface, "a layer of dark purple called the uvea and in brown eyes there is an additional layer of yellow or perhaps brown-red pigment on its outer surface also, and in some cases there is a deposit of pigment amongst the fibrous structures. In the albino, where the pigment is entirely absent from both surfaces of the iris, the bright red blood is seen through the semi-transparent fibrous tissue of a pink color; and in blue eyes where the outer layer of pigment is wanting, the various shades are due

to the dark inner layer of pigment showing through fibrous structures of different density or degrees of opacity." When both parents have blue eyes all of the children will have blue eyes. When both parents have brown eyes, all of the children may have a brown iris or about one quarter will be blue-eyed. When one parent has pigmented iris, while the other has blue, the children either all have pigmented eyes or half of them will be blue-eyed. The eugenic value of the inheritance of eye color lies in the consideration advanced by Major Woodruff that pigmentation of the eye and skin better fit the child for life in the tropics or in a country, like the United States, of bright sunlight.

In the heredity of hair color the most striking result is that dark-haired children probably never come from flaxen-haired parents or a good practical rule is that children will not acquire hair darker than that of the darker parent. The inheritance of red-hair color has a certain eugenic importance. Rarely does a red-haired person marry a person with red hair. There seems to be a strong antipathy between the two. Davenport in spite of prolonged inquiry among thousands of families could obtain only two cases where both parents had red hair. When both parents are red-haired as far as could be discovered all children are red-haired. Red-haired offspring may come from two brown or glossy black-haired parents provided both form red-hair germ cells. In that case both dark-haired parents will have ancestors or other close relations with red hair.

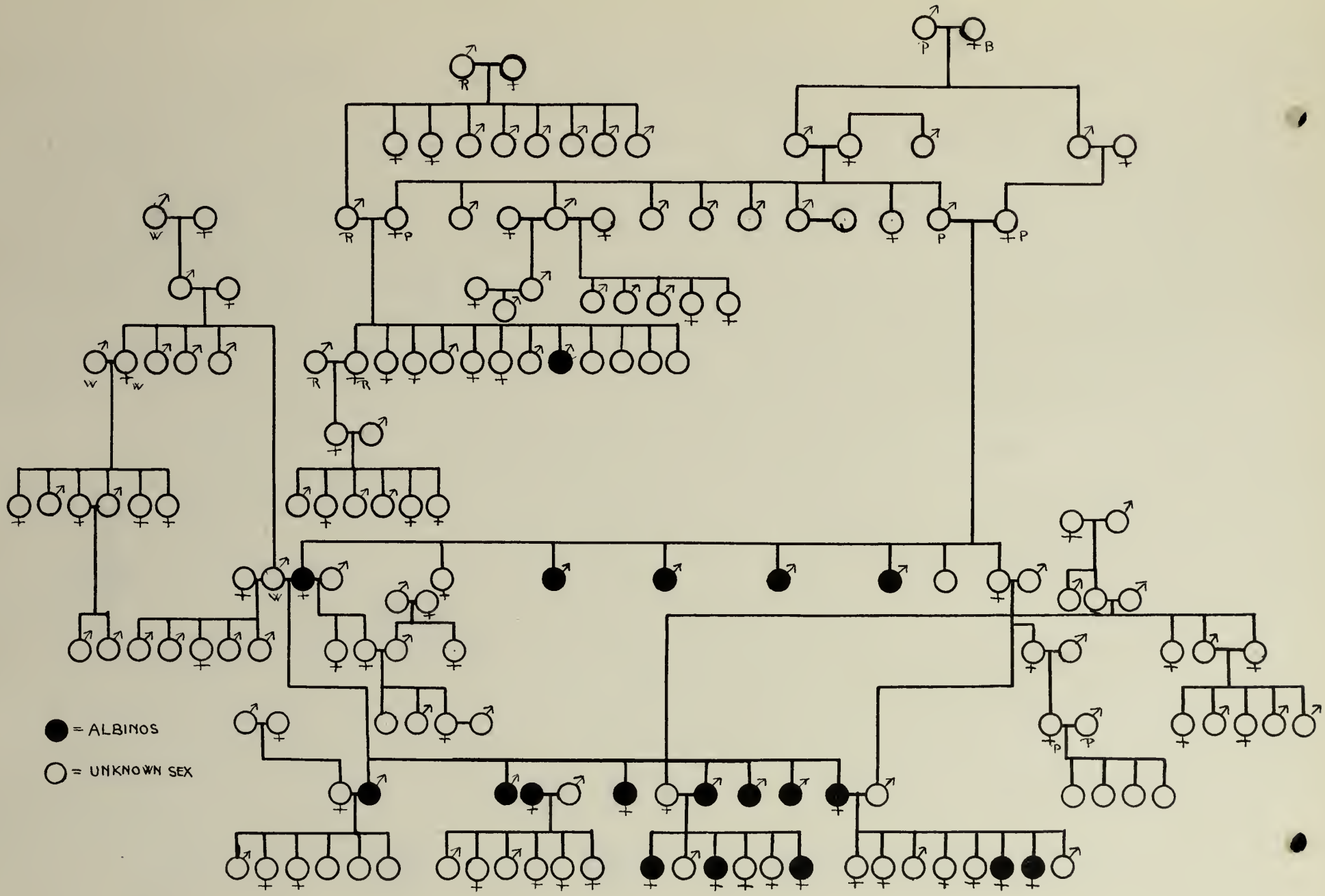
The pigment of the skin is due to brown granules lying in the deep stratum of the skin. When one parent is white and the other a full-blooded negro the offspring are mulatto or intermediate in shade. Two of these very light colored parents will probably have only light colored children, who a-

way from home would pass as white people. As far as skin goes they are as white as their great grandparent.

There are cases of lack of pigment in skin, hair and eyes and this condition is called albinism. Its inheritance is similar to that of eye-color. When one parent only is an albino and the other is unrelated to albinos, the children are all pigmented. When both parents are albinos, all the children are lacking in pigment. Albinism is not desireable, because the lack of pigment in the eye makes it hard for the retina to bear strong light. There are several albino communities in the United States that are inbred. The chart given gives a diagram of one of these families.

Musical ability in the most marked cases develops early in the offspring. Bach matured at twenty-two, Beethoven published compositions at thirteen and Mendelssohn at fifteen, while Mozart composed at the age of five. The Bach family comprised twenty eminent musicians and two score of less eminent ones. The exact nature of inheritance is not as yet discovered. Hurst in 1908 suggested that it acted as a recessive, as though it depended upon the absence of something. Usually if there are parents without musical ability, the offspring are poor and if the parents are good all of the children are medium or exceptionally good.

Two contrasted temperaments are usually easily recognized. One may be phlegmatic, slow, rarely depressed and the opposite nervous, quick and gay one minute and the next most depressed. Between these cases there are many intermediates. When both parents are nervous, but have phlegmatic ancestry, about one fourth of the offspring will be phlegmatic. Nervous parents of nervous origin have nervous children.

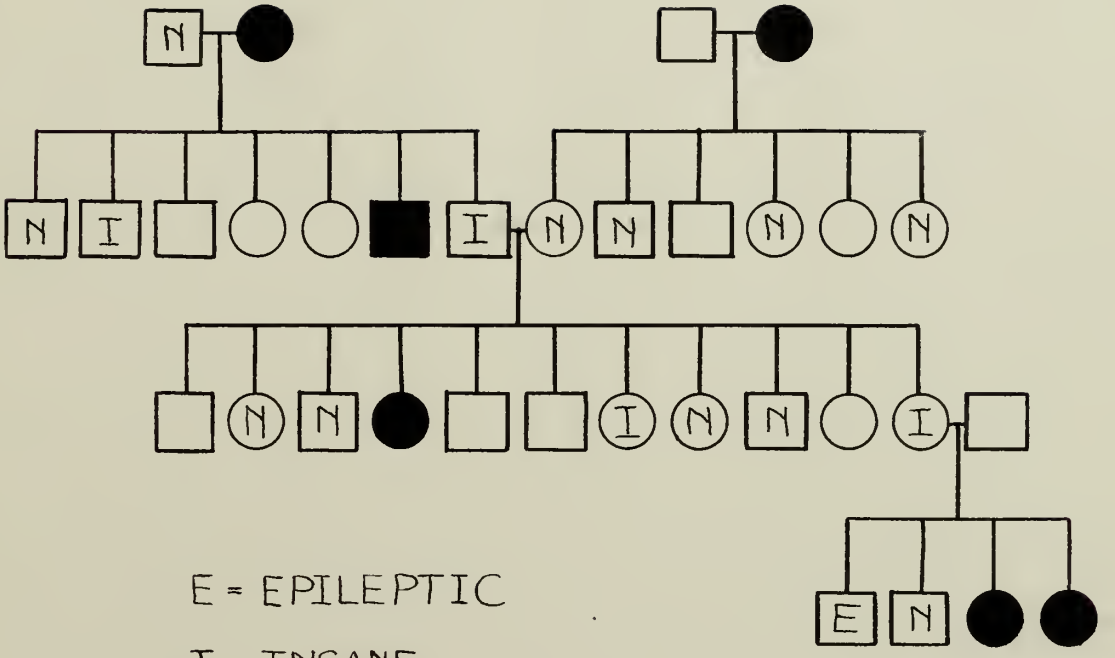


PEDIGREE CHART of AN ALBINO FAMILY

B, P, R, W = 4 COMMON SURNAMES IN THIS INBRED COMMUNITY

Insanity covers a vast quantity of victims of great variety. Two great classes of insanity are distinguished, the "organic" and the "functional." The first group includes cases of mental deterioration associated with venereal diseases, alcoholism and degeneration of the blood vessels. The second group includes cases of distinct neuropathic taint which shows itself in the slighter forms as melancholia or manic depressive insanity and in profounder forms as dementia precox. If there is insanity in the stock of both parents, even though they are normal about one-fourth of the offspring becomes insane. A hereditary predisposition lies at the basis of most cases of insanity and this predisposition behaves in heredity like a defect. Insanity is often referred to as a single trait, but it is merely a result and not a specific trait. Some cases of insanity indicate an inborn weakness of the nervous system, such as leads it to break down under the incidence of heavy stress. Sometimes insanity is due to an injury to part of the brain, perhaps from a bullet wound. There are a number of forms of insanity that are due to nervous weakness. The charts show inheritance of neuropathic taints. In both cases the central matings are of individuals of neuropathic stock and are closely related to insane individuals.

Perhaps the most wonderful mechanism in nature is the complex of neurones, sustentative tissue and blood vessels that constitute the central nervous system. Variations in structure and derangement of parts is likely to occur and can be inferred from the actions of the person. Peculiar or abnormal behavior is an index of peculiar or abnormal brain condition. That heredity plays a part in nervous diseases is shown by the familiar fact of some psychic disturbance appearing in the members of a single family. Varied as are the mental conditions of the persons in a family containing feeble-mindedness, the children do not ordinarily surpass in mental development the better developed



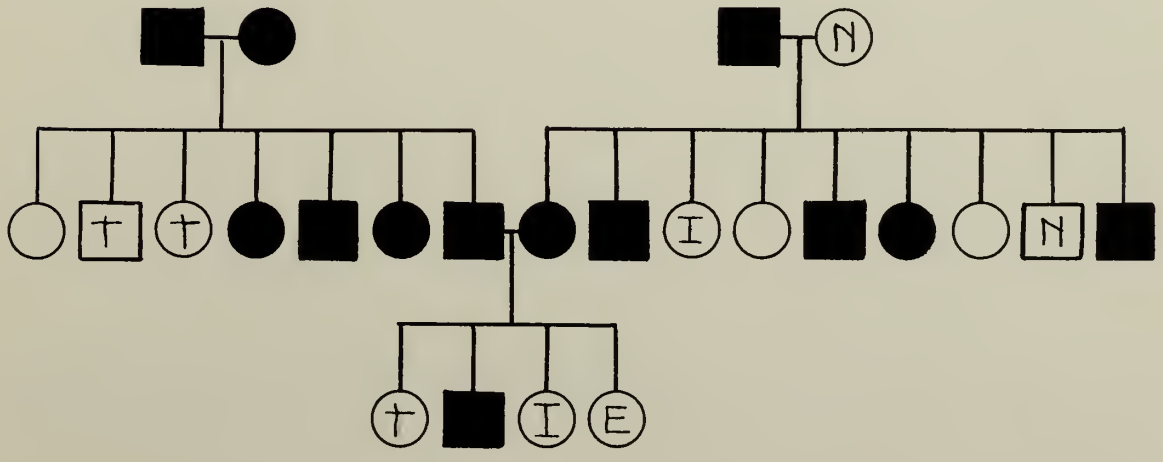
E = EPILEPTIC

I = INSANE

N = NORMAL

□ = MALE ○ = FEMALE

† = DECEASED



BLACK SYMBOLS IMPLY a NEUROPATHIC CONDITION OTHER THAN INSANITY

parent.

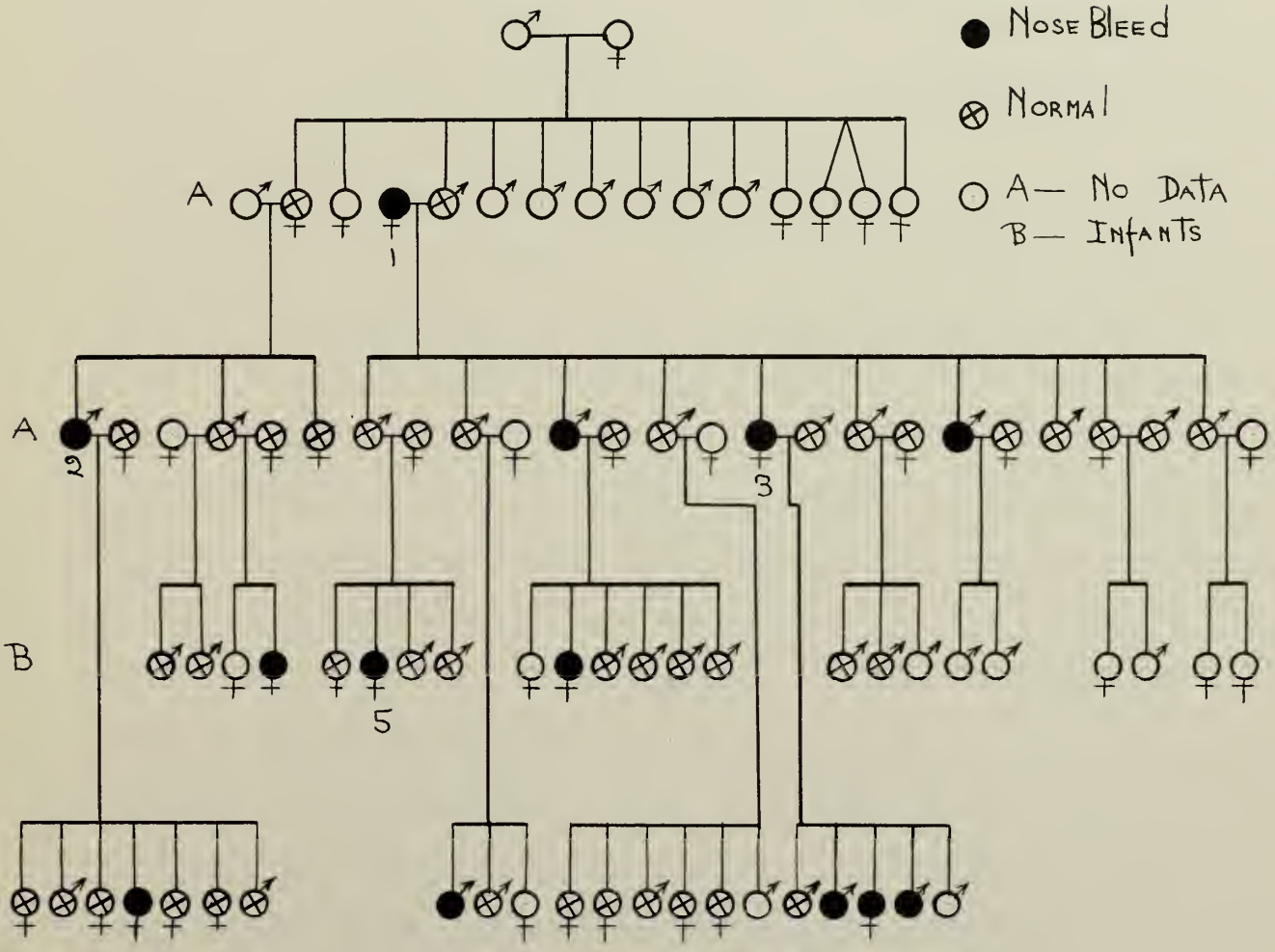
Hysteria indicates a functional disturbance of the psychic centers usually combined with a derangement of the lower cerebral or spinal areas. The psychical symptoms approach mania on the one hand and show a more or less complete loss of the moral sense on the other, so that many cases of larceny, assault and sexual immortality are consequent upon this disease. The greatest social importance of hysteria lies in its relation to crime and responsibility. Many criminals no doubt need medical attention. The family history of an offender of the law will give the best possible clue to his probable mental condition and where a neuropathic blood is evident, the patient should be segregated in order not to spread further the tainted germplasm. In Berkeley, California, the policemen are sent to the University to study psychology, criminology and other subjects that bear on the scientific treatment of crime. They are thus made more effective in handling criminal tendencies among the population.

Deafness of certain sorts is clearly hereditary. There are three types of inheritable deafness in general. First, that due to defects or changes before birth or shortly after, giving rise to deaf mutism. Second, otosclerosis or hardness of hearing with usually progressive symptoms. Third, catarrhal weakness of the mucous membranes, rendering them liable to infection with inflammation and suppuration. Deaf mutism appears early in life, before speech has been acquired. The inheritance of deaf mutism has been disputed and some countries have forbidden the marriage of this class. It is clear that such marriages are in the long run dangerous. That all children of such marriages are not deaf is probably due to the fact that the parents are not deaf in the same way and that one parent brings into the combination what the other lacks. The con-

trast between the result of marriages of two congenitally deaf parents and two who are adventitiously deaf is shown by the fact that the latter yield only, 2.3 per cent deaf children.

The peculiarity of supernumerary fingers and toes is one that is inherited in nearly typical fashion. The extra toe is due to an additional unit so that when one parent has the extra toe the children will have it also. If the offspring do not have the extra toe, when they become parents, their children may have this polydactyl condition. Professor Scott has noted a case of a boy with twelve fingers and twelve toes, the extra fingers being boneless. The boy resembles his father and of the other children one son has extra toes, one an extra toe and an extra finger on the left hand only. One sister has extra toes only and the other five children are normal in respect to the number of toes and fingers.

A recent case of hereditary nosebleed has been reported by Willis Lane. Nosebleed was noticed to be common to certain young people nearly every day with no apparent external cause such as injury or exertion. An inquiry resulted by showing thirteen cases as represented in the chart. The individuals possessing the trait have frequently copious and regular nosebleeds. The bleedings are first manifest in either sex in the period of adolescence and continue until the individual is eighteen or twenty. In a few cases bleeding occurs every day and in some cases but three times a week. This loss of blood does not seem to hurt the individual and merely requires time off from their work or play. With but one exception all individuals with this peculiarity were healthy and vigorous. In fact it seemed that those who bled from the nose the most and lost the most blood were the ones of greatest activity and developed most rapidly. Days when the nose bleeding did not occur the subject would have headache and



INHERITANCE of NOSEBLEED

a general bodily and mental depression which would be relieved by the nosebleeding. There was a general blood congestion, which stayed until the pressure of the blood was reduced. Individual number two in the second generation showed this peculiarity most pronounced in his 16th year and yet at this time there was a remarkable body growth. He worked hard and was not sick. The nose bleeding diminished in his 17th year and entirely ceased in the 18th. Individuals marked 1 and 5 on the chart were characterized by menstruation which occurred regularly three times a week until the 18th year. Individual number 3 had nosebleeds throughout her life and died from one at the age of forty-five.

This peculiarity appearing at the age of puberty may bear some relationship to the developing sex organs. There may be a stimulation of blood formation faster than the body can care for it and the excess blood leaves the body in breaking through the mucous membrane of the nose. The superabundance of blood would account for the rapid development and increased activity at this period. As the internal secretions and the body became more adjusted to each other, the phenomena diminished and disappeared in all but one case. Davenport says this disease or epistaxis may be a family disease characterized by its frequency and severity and occasionally by its fatalness. In some cases from an affected parent all, in others half, of the children are affected. The suspicion is that the disease is due to the presence of a positive trait, which should make people having a violent form of the trait hesitate to have children. This trait differs from hemophilia, of which I have spoken, in that it occurs equally in both sexes only for a few years and then disappears. The blood also appears to coagulate normally, which does not occur in hemophilia. Some persons suffering from catarrh have frequent nosebleeds due to ir-

ritation or slight injuries of the mucous membrane of the nose.

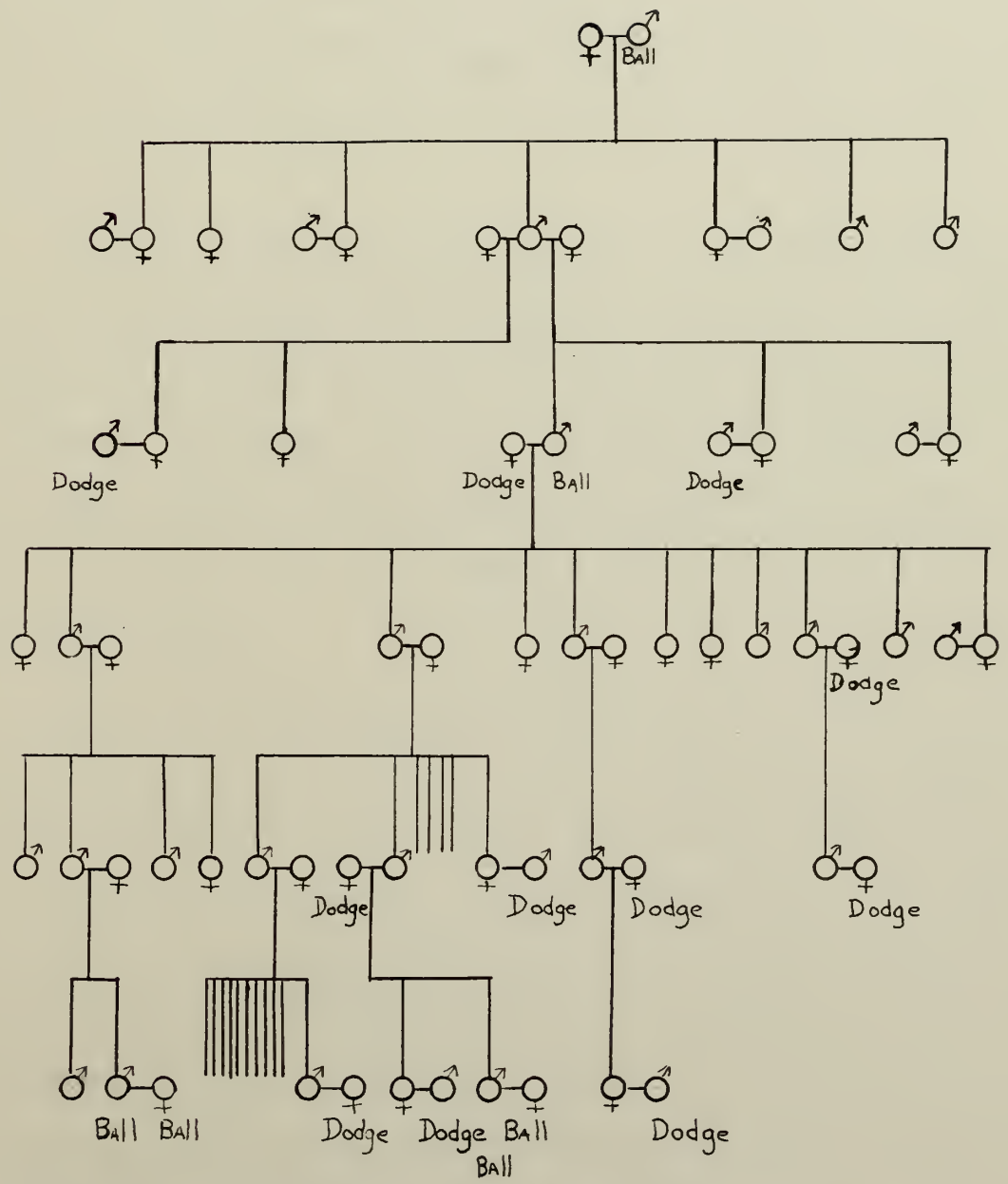
An extraordinary case of human fecundity is recalled from the Zentralblatt für Gynäkologie on the authority of Gesellschafter in 1834. The case is that of a man whose first wife had quadruplets four times, triplets three times and twins ten times and whose second wife had triplets once and twins ten times. The man was the father of sixty-eight children and it seems that the tendency for multiple births was due to the father rather than the mother although this seems hardly conceivable. A recent study, however, in the twinning in sheep has indicated a slight influence on the part of the sire in the production of twins. Fecundity is an important factor in the practical application of genetics, whether in eugenics or animal breeding, and any method of increasing the fecundity of valuable strains would be of great use to the eugenist and to the breeder.

A country characterized by much inbreeding will have a population that is affected chiefly by negative traits with a slight tendency for positive traits to increase, while a country that is settled by a restless people will show a small percentage of negative traits and a high percentage of positive ones. The customs of civilized nations oppose certain limits to marriage as regards relatives. The union of brother and sister or of parent and child is not unknown. Various observers report that among the Weddas of Ceylon probably on the account of the sparsity of the population and the isolation of families, the marriage of brother and younger sister has been permitted by local customs. In ancient times the marriage of parent and child was not opposed by the customs of Persia. Today, however, all such unions are exceptional. It

has been said that the Eskimos of Behring Strait favor the union of first cousins, because in time of stress and hunger the blood tie will be found stronger than the marriage tie to hold the family together. Defects in germplasm tend to reveal themselves in the offspring of cousin marriages, but tend to disappear entirely in the children derived from outmatings. We are told that in the family of the Ptolemies and the royal family of the Incas the marriage of brother and sister repeatedly occurred but we can ask "Where are the Ptolemies and Incas now." In corn breeding self fertilization rapidly leads to loss of productivity and vegetative vigor.

Barriers to free and wide marriage selection favor consanguineous marriages and the formation of races with peculiar traits. These barriers are physiographic or social. Physiographic barriers may be due to mountainous regions or barriers of water. The islands off the Maine coast show much consanguineous marriage. In Small's History of Swan's Island published 1898, it is stated that the amount of intermarriage of persons of the same name in Mount Derest Island, Gott's Island, and Swan's and Deer Islands makes genealogy confusing. At western Martha's Vineyard there has been much consanguineous marriage. Deaf mutism is very common there and in 1880 there was a proportion of one to twenty-five of the whole population affected. Hermaphroditism is also common. The important barrier of the height of the land has made very famous the cretins and imbeciles of the Alps.

Social barriers are numerous and complex. There are the barriers of clan, pride of blood, barriers of language, race and religious sect. There has been an inbreeding due to a desire to concentrate wealth and



FREQUENCY of MARRIAGE between DODGE AND BALL FAMILIES of BLOCK ISLAND R.I.

and power among the royal families of Europe. This is especially true in the house of Spain which I have shown before. This barrier of clan is causing the downfall of many of America's finest families. Balch wrote in 1915 "I tell you signs are not wanting that if the fine old New England blood despises the ignorant foreigner and stands aloof from him, there will soon be another interesting example of a fine old stock--and our Planter's stock is a fine old stock, and a sturdy stock,--making a pathetic and unedifying end."

Institutions where are gathered people with the same defect lead to marriages with bad offspring. Institutions of deaf mutes lead to intermarriages and sometimes sanitaria and hospitals for the "curable" insane do likewise. The practice of the sign language groups together, in adult life, these deaf mutes and they avoid the society of hearing people. Marriage licenses of a large city frequently show bride and groom from the same house address.

The barrier of the religious sect has been erected often to insure the inter-marriage of the faithful. This is shown by the teachings of the Friends, the Shakers, and the Dunkers. In the early history of the Dunkers marriage outside the church was punishable by expulsion. It is still frowned upon, but the church has become more liberal as it has progressed. The Amish of south eastern Pennsylvania with much marriage of kin show great frequency of epilepsy and crippled children. It is difficult to see how religious sects would have tenets so opposed to the laws of Nature and God as practically to compel consanguineous marriages.

Unit characters do not blend and after a score of generations some given characteristic may still appear unaffected by the repeated unions

with foreign germplasm. From two English parents, one of whom was remotely descended from the royalty, was born Elizabeth Tuttle in Massachusetts. She was a striking woman, beautiful, tall and of intellectual and physical vigor. In 1667 she married Richard Edwards, a well known lawyer, who was tall and manly. In 1691 they were divorced and Mr. Edwards married again and from his second wife arose a line of mediocre, ordinary offspring. The son of Elizabeth Tuttle and Richard Edwards was a remarkably brilliant man, graduating from Harvard with the degrees of Bachelor of Arts and Master of Arts together. He became pastor of the church in East Windsor, Connecticut and of his eleven children, the only son, Jonathan Edwards was eminent as a theologian and president of Princeton College. Among his descendants were presidents of Union college, three presidents of Yale University, Hamilton College and Amherst College, a general of the Civil War and founder of the iron industries of north Alabama, the founder of the Columbia Law School, Winston Churchill and others of America's great educators, students and moral leaders of the republic. The defects of Elizabeth Tuttle appeared in Pierrepont Edwards who was a tall, brilliant, acute jurist, but eccentric and licenticus and in Aaron Burr, Vice President of the United States. From her four daughters came a line of distinguished descendants, including Ulysses Grant and Grover Cleveland. The germplasm of Elizabeth Tuttle was certainly instrumental in elevating and raising the position of our nation in culture and learning.

An example exactly opposite to this of Elizabeth Tuttle shows where harm comes from a single man. This has been traced out in the history of the wellknown Jukes. They lived in a small valley hemmed in by steep hills only three hundred feet high. Max Juke was one of the early settlers among the Dutch in the backwoods of New York State. His two sons married

two sisters. One of these, Ada, is known as the mother of criminals. She was indolent and a harlot before marriage, with one illegitimate son and four legitimate children. The first son was indolent, licentious and syphilitic. He married a cousin and had eight syphilitic children. Of the seven daughters, five were harlots, one an idiot and one of good reputation. Their descendants show much harlotry, licentiousness and consanguineous marriage. The second son was industrious and married a cousin. Their offspring consisted of insane, paupers and licentious individuals. The illegitimate son of Ada was industrious and an honest worker, but the offspring were criminals, paupers and drinkers. Thus the criminality lies in the illegitimate line from Ada and not in the legitimate, doubtless due to a difference in the germplasm of the fathers. Throughout five generations of the other Jukes are found sexual immortality and pauperism. Up to 1887 the progeny of the Jukes had cost New York State over a million and a quarter of dollars in seventy-five years and still their germplasm has been living on in the subsequent thirty-nine years.

The Ishmaelites are a group similar to the Jukes. They are traced back to a single man and have had a family line including murderers, illegitimacies and prostitutes. They live by petty stealing, begging or ash gathering.

The study of genealogy, under the stimulus of our present insight into heredity is destined to become the most important hand maid of eugenics. The conscientious and scientific genealogist records a brief biography of each person and this should include an inventory of his physical and mental characteristics and his special tastes and gifts. Such genealogical studies show each family to be stamped with a peculiar set of traits depending upon the nature of its germplasm. Some families will

show great scholarship, others financial success and so on. Some families may have a tendency to be fat and others to be thin. A unit character which a remote ancestor possessed may reappear. A germ plasm that produced a mathematical genius only once a century ago, may produce another not less noteworthy. Two parents without mathematical genius might bring together germ cells whose union would favor a mathematical prodigy. Genius frequently appears in families with mental defects, insanity or neurotic tendencies. Sturdy, stolid communities produce few insane people.

In the United States in October 1910 was started the Eugenics Record Office at Cold Spring Harbor, Long Island, New York. This is connected with the American Breeders' Association. Here the collecting and cataloguing of records is constantly going on. It is hoped to establish a complete indexed collection of published genealogical and town histories for the United States as well as manuscript reports of field investigators. A bulletin is issued from the Eugenics Record Office giving instruction on making a eugenical family study. Cards and materials are sent to individuals if they are interested and desire to make out their family chart and record and return it to the office. It is important to record the personal traits for as many as possible of the members of one's family for they serve to help interpret one's own constitution, to secure data for the future uses of society, to assist in the choice of a vocation, in education and in marriage selection. The main work of the office is investigation into the laws of inheritance of traits in human beings and their application to eugenics.

Since the days of Plato arguments for the improvement of the human race have been urged and especially attention to marriage matings. When we consider that New York State spends one-seventh of its state income

for the care of the insane, it is not surprising that there is much search for the reason why this is so. Knowledge of the laws of heredity and a true insight of the facts regarding various traits are desired. Mankind goes blindly on its way, mating almost at random and then, after two or three generations all knowledge of the matings that have gone before are lost. Because the nature of the mating is of such profound importance for the progeny, a knowledge of genealogical history is of the greatest moment in connection with marriage selection. The presence of highly undesirable dominant racial traits in the family of either one of a pair of young people who are becoming much interested in each other should be known to both. If they marry and have children in the face of the knowledge that at least half of their children will have the same undesirable trait, it may serve as a sad example for the next generation which may mingle some intelligence in its wooing.

In Germany there was formed an International Society of Race Hygiene. In the parliament in Berlin from October 26 to 28 in 1915 about one thousand delegates attended the semi-official "Deutsche Zentralstelle für Volkswohlfahrt" corresponding to the United Charities in America. The conference was for the purpose of finding ways and means against the evil consequences of war and modern civilization which menace the vitality of the race. The war kills the best, the bravest and the healthiest. The race hygiene movement in Germany has a positive conception of aiming always at the multiplication of the fit. Simplicity in customs and mode of life, a full understanding of individual duty towards society, a high valuation of family life, and the system of one family houses were the main remedies proposed. The present war is taking from both sides combatants, who have been preëminent for their con-

tributions to science and art. Mating at the outset of the war is hurried and greatly increased. There is also sometimes an increase of illegitimacy in the neighborhood of training camps. These matings do not represent as much maturity of judgment as there would have been in times of peace. Among the superior women left at home many never marry because of the lack of sufficiently eligible suitors caused by the war.

In America migration is especially interesting as the continent was devoid of population, except for a few scores of thousands of Indians. Settlers consisted of people of all classes, many society idlers taking it as an adventure. The London Company sent over felons, murderers and women of the streets to relieve the city of them. The colony protested against being made a penal settlement and although the matter was partly adjusted importations of convicts did not entirely cease until 1788. About twenty thousand convicts were transported into the Virginia colony, but judged from present statements by no means would all be considered immoral. On the execution of Charles I better blood crowded into the colony and then began some of the first families of Virginia.

Around Manhattan Island and on the Hudson, the Dutch founded trading posts and such sturdy, industrious stock has given rise to the commercial center of the western world.

On the bleak coast of New England settled strong-hearted idealists. They included scholars and teachers and men of "gentle breeding." The germplasm of these men shows its traits in the vast number of descendants and has established New England's reputation for conscientiousness and love of learning and culture.

On the waters of the Delaware settled Penn's band of thrifty and

strong followers. Thus the characteristics of each commonwealth were early determined by the traits of the persons first there. There were traits of restlessness and ambition and this ambitious tendency still shows itself in the present generations.

In rural districts located near some city we find more indolent alcoholic and feebleminded due to the tendency of the strong and sound to go the city in order to advance in business and money making schemes. The large cities lure to them much of the best of the rural protoplasm and then surround it by conditions that discourage reproduction or make children too great an expense. To some degree therefore the cities act anti-eugenically, sterilizing the best and leaving the worst to produce their like.

The dangers of recent immigrations from foreign countries, lie in the overflow to our shores of hereditary unfitness. The causes that lead to degeneration have long been at work among the poor of Europe. The slums of every city in the Old World are full ot the results. The slums of London, filled for the greater part by the descendants of those whom war could not use, develop a type of men who cannot make a living anywhere under any conditions. Few cases of hereditary inefficiency exist in America that could not be traced back through pauper lineage to dependent classes in the Old World.. It takes many generations to develop a pauper stock. The essential danger of unrestricted immigration is not in bringing in an alien population strange to our language and customs. Language and customs count for little if the blood is good. At New York we should turn back, not ill, aged or infirm individuals that are likely to become a personal charge upon public charity, but should especially reject those whose descendants are likely through incompetence

and vice to be a permanent burden on our social or political order. Every family of "Jukes" or "Ishmaels" which enters this country carries with it germs of pauperism and crime. Wherever such germs travel there are inefficient men, sickly women, frowsy children, starved horses, carelessness, vindictiveness and neglect of decency.

Eugenics looks forward hopefully to the future. Some enjoy looking backwards, but it should be only to appreciate the darkness and obscurity from which we have emerged. The eugenist to learn the real lesson of organic evolution and human history must often look behind him. Thus he can obtain a deeper truer knowledge of the principles of heredity and an appreciation of heredity is the basis upon which the improvement of the racial qualities of the future generations depends.

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